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THE IRON TRADE REVIEW

VOLUME XXXIII. CLEVELAND, O. JANUARY 4, 1900. CHICAGO, ILL. NUMBER 1

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THE IRON TRADE REVIEW

VOLUME XXXIII. CLEVELAND, O. JANUARY 4, 1900. CHICAGO, ILL. NUMBER 1

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The iron trade looks into the new year from a very different view point from that of twelve months ago. Then the prospect of an upward trend of prices was so plain that there was no room for difference of opinion, though the majority of authorties would have considered $3 a ton the limit of the advance in pig iron rather than the $14 actually reached. Today inquiries as to the course of prices in the half year just ahead are just as generally and as insistently made as at any time in the extraordinary year just closed. There is one point of difference, however. Anxiety as to the possibility and extent of further advances is largely eliminated from the present situation; and heavy buying to provide against higher prices is not likely to be a feature of the months just ahead. It is quite apparent that the general expectation of buyers is that prices for the second half, if not the second quarter, of 1900 will be lower for most products than they are today. This widespread belief promises to determine the character of buying for some time to come. It may be based on a mistaken judgment, but it is likely to be followed unless events demonstrate that it is in error, and thus there will doubtless be an absence of the precautionary figuring that led to the placing of so many contracts last year when the upward movment was well under way. With 50 per cent of the pig iron production of 1900 sold in advance, though not all of this for shipment in the first six months, it is not to be expected that any sensational market turns will be encountered for weeks, if at all. The significant fact today is that the sensational crash in Wall Street and the dullness of holiday time have left pig iron prices thus far untouched. Against the fact that production has overtaken demand, sellers of iron point to the general urgency with which deliveries are called for, and the further fact that a good many important consumers who began in November to wait for prices to decline have yet to buy for a round percentage of their requirements in the next six months. In some cases the test will be made on the advanced iron and steel freights effective Jan. 1—whether buyer or seller shall stand them on the next purchases made. Bessemer pig remains at $25, Pittsburg, and is very firm in view of a slight curtailment of operation due to the recent interruption of ore movement from the docks. Foundry irons are unchanged in all markets. In steel billets the indications are that while the mills are not so well filled with orders as are the blast furnaces, the expectation of buyers who have been waiting for a decline will be disappointed for the present, at least. Bessemer steel capacity has not increaesd in the year, apart from the completion of a new plant in the Wheeling district; and with rail mills so heavily sold for 1900 they will not be heard from in the billet market. All lines of finished material are quiet, with prices for plates a trifle easier, bars strong and sheets stationary. Structural mills are well occupied and the prospect of spring work is counted excellent, if money conditions do not change unexpectedly for the worse.

PITTSBURG.

OFFICE OF *The Iron Trade Review*.
705 PUBLICATION BUILDING, Jan. 3.

The new year has opened very quiet. While there is quite a general impression that prices may go higher in the course of a month or two, the feeling is also general that as prices, measured by ordinary standards, are quite high, this will be a year in which to buy cautiously and as conditions from time to time seem to warrant. It is hard to believe that much can be gained by contracting far ahead and so no doubt the general policy will be to buy only for clearly defined wants. The present prosperity depends, not on confidence, but on actual consumption, and so nothing is lost by the absence of what is frequently characterized as speculative buying, while should any weakness come about it will not develop such a general slump as would otherwise be the case.

Prices in general are unchanged from the basis of the last few weeks. In both billets and sheet bars makers are considerably more firm in their views and indications point to a steady maintenance of prices in this line. While the steel mills do not begin the year with nearly as large a tonnage on their books as do the blast furnaces, they still have a good tonnage of orders, including material lately sold and material on old contracts. In finished lines there is a fair tonnage of orders placed, and no producer need be anxious to secure orders this month. There are excellent prospects of a good year's business, while the fact that producers of the cruder materials are heavily sold ahead, at high prices, will make them quite anxious to maintain prices, even in the face of depressing conditions which have not yet manifested themselves, and do not seem likely to do so.

PIG IRON.—The furnaces are well sold up for the first half of the year, but there is still some selling being done. In Bessemer it is regarded that any sales now made will simply increase the tonnage to be carried over into the second half. Production has not been up to the rate of November and early December. The dock strike left the furnaces bare and they have had to depend on ore brought down from lower lake ports during the cold weather, some of which is frozen and must be dynamited out of the cars. The result is that two or three furnaces have been off for a few days, while others have had to curtail production. During the week there have been several small sales of Bessemer pig iron, for delivery in the first quarter, aggregating between 5,000 and 10,000 tons, at $25, Pittsburg. There is very little Bessemer iron sold for the third quarter, and what has been sold is in connection with sales calling for deliveries in the first and second quarters. The advance of 15 cents in the freight rate on iron from the valleys to Pittsburg went into effect the first of this month, the new rate being 90 cents. In foundry and forge iron the market has been quiet, but the tone is strong and prices are unchanged. We quote the market as follows:

Bessemer, valley furnace	$24.00	to	$24 10
Bessemer, Pittsburg	24.90	to	25 00
No. 1 Foundry	23.75	to	24.00
No. 2 Foundry	23.00	to	23.25
No. 3 Foundry	22.25	to	22.50
Gray Forge, valley furnace	21.00	to	21.25
Gray Forge, Pittsburg	21.00	to	21.50

STEEL.—There is generally a firmer feeling among steel mills. There is an inquiry in the market for a large tonnage, which will probably be closed shortly. It is very doubtful if anything could be done below $35, Pittsburg or Valley mill, on 4x4 billets, or $36 on sheet bars or small billets. Buyers

are beginning to realize that the steel market is firmer than they thought it was, and it is likely they will take hold before long. The steel mills have a fair tonnage booked for delivery in the first half of the year, but there is a great deal of steel still to be bought. In wire rods there is practically no market.

FERRO-MANGANESE.—There is no change to note in this line since the advance mentioned last week, and we now quote domestic 80 per cent ferro at $125 for large or small lots.

RAILS AND TRACK MATERIAL.—There has been nothing special done in rails, while there is the usual small tonnage of track materials. Prices are without change, and we quote: Rails, standard sections, over 200 tons, $35; 100 to 200 tons, $37; car lots, $38; less than car lots, $40; light rails, 25-pound, and less than 50-pound, $37, all f. o. b. mill, Pittsburg; track material—Spikes, 2.50c; track bolts, square heads, 3.60c; hexagon heads, 3.85c; splice bars 2.50c to 2.60c; links and pins, 3c to 10c.

BARS.—The market for both steel and iron bars is quite firm and it is probable that a fair tonnage will be bought during this month. There is no pressure to secure immediate delivery. We quote steel bars at 2.25c base, half extras; common iron bars, 2.15c, valley, and refined iron bars 2.40c, Pittsburg.

STRUCTURAL MATERIAL.—The mills start the year with a fair tonnage of orders on their books. Contracts are being made form time to time with bridge builders and others for fair sized lots. There will no doubt be a great deal of building this summer, but as yet not a great deal has been closed in the way of structural material for large buildings. There is no probability of any change in prices one way or the other for some time, and we continue to quote: Beams and channels 3 to 15 inches, 2.25c; 18 to 24 inches, 2.35c; tees 2.30c; zees 2.25c; angles, 2.25c. Universal mill plates, 2.50c to 2.75c, according to delivery and size of order. The manufacturers at their recent meeting voted to continue the present arrangement for another year.

PIPES AND TUBES.—The market continues in fair shape. The mills are practically free of contracts for low priced material and are booking a fair tonnage of orders. Nothing is taken for forward delivery except for material that is certain to go into consumption direct. We quote unchanged as follows: Merchant pipe, 50 and two 10's for car-loads delivered within the specified territory; well casing, screw and socket joint, 37½; inserted joint, 32½, with an optional 5 per cent to dealers only; boiler tubes 1¼-inch to 1½-inch, 40 per cent off; 1¾-inch to 2½-inch, 50 per cent off for iron, and 55 per cent off for steel; 2¾-inch and larger, 52½ per cent off for iron and 55 per cent off for steel, with 5 per cent additional in carloads, less than carloads being f. o. b. mill.

PLATES.—The plate market is still rather weaker than the general run of material. For tank plate there have been some very low quotations, especially for narrow plates, as low as 2.25c being named, while some sellers have asked as high as 2.50c, for wide plates. The market stands at about 2.40c. We quote shell steel at 2.60c to 2.70c, flange, 2.70c to 2.80c and fire box 3¼c to 4c.

SHEETS.—The market is rather quiet, but is firmer than it was, although No. 28 gauge can still be had at from 2.95c to 3c. Galvanized is stronger, and it is understood that nothing below 75 and 5 per cent off, with a 15-cent freight allowance, can now be done.

SPELTER.—The spelter market is weaker than at last report, and prime western grades can be had at 4.50c, Pittsburg.

OLD MATERIAL.—The scarcity in old material is hardly as pronounced as it was, but prices are quoted as high as formerly. There has been little done, and the following quotations are largely nominal, Pittsburg, gross tons, except where otherwise specified: New Bessemer melting stock, $26 to $27; basic open-hearth scrap, $28 to $30; steel rails, mixed lengths, $22 to $23; short lengths, $23 to $24; iron rails, $29 to $31; cast borings, $14 to $15, net tons; cast scrap, $18 to $20; No. 1 wrought scrap, $24 to $25, net tons; busheling scrap, $16 to $18, net tons.

COKE.—The coke trade is quiet and prices very firm. There has been a fair tonnage of foundry coke bought for delivery early in the year, while furnaces have pretty well provided for their requirements all through the year. We quote strictly Connellsville furnace coke at $2.75 to $3 and foundry at $3.25 to $3.50.

CHICAGO.

Office of The Iron Trade Review,
1522 MONADNOCK BLOCK, Jan. 2.

The usual holiday quietness characterized the business of the last week of the old year. Sales of all classes of material were comparatively small, although there is a good inquiry for material which will probably be placed within a very short time. According to the views of some of the principal iron and steel men of the city, including both sellers and buyers, the coming year will be one of great prosperity in all lines, and particularly in iron and steel. It is the belief of these men that the use of iron will be largely increased, even over the record breaking year of 1899. A considerable difference of opinion exists as to the probable course of prices in the coming year. Most makers of material incline to the belief that values will be more apt to increase than decrease or remain stationary, in the first half of the year, but that the fluctuation in any case will not be great. If the demand keeps up, as seems almost assured now, there is very little doubt that prices in the near future will be at least as high as at the beginning of the year, and it is quite likely they will advance. Mills and furnaces are already sold far ahead on many grades of iron and steel, and costs for the coming year are fixed sufficiently to assure makers that they will not be less during the year.

PIG IRON.—Not much was done last week, partly because of the holidays, and partly for the reason that most buyers wanted to wait until after the first of the year before placing any contracts. What sales were made were all in small lots, and most of them for immediate shipment. Prices have not changed in the week. The outlook for the future is excellent, and foundries are all running full, and have plenty of work ahead, so that it is expected full operations will be the rule for the coming year. Whether the demand for castings increases in the next year or not the total of business will be larger than in 1899, as during the first part of last year consumers were not using as much iron as they did for the last half of the year, and the rate of consumption is at present larger than ever before in this district. The increase in foundry capacity in the past year has been very great, as many old plants have been enlarged, and several new plants have been built. The range of prices for the opening of the year is as follows:

Lake Sup. Charcoal	$25 50 @ $26 50	Southern Coke No. 3	$21 00 @ $22 00
Local Coke Fdy. No. 1	25 00 @ 25 50	Southern No. 1 Soft	23 00 @ 24 00
Local Coke Fdy. No. 2	24 50 @ 25 00	Southern No. 2 Soft	22 00 @ 23 00
Local Coke Fdy. No. 3	24 00 @ 24 50	Southern Silveries	26 50 @ 27 00
Local Scotch Fdy. No. 1	25 00 @ 25 50	Jackson Co. Silveries	32 00 @ 32 50
LocalScotch Fdy. No. 2	24 50 @ 25 00	Ohio Strong Softeners	24 50 @ 25 00
Local Scotch Fdy. No. 3	24 00 @ 24 50	Alabama Car Wheel	24 00 @ 26 00
Southern Coke No. 1	23 00 @ 24 00	Malleable Bessemer	24 00 @ 25 00
Southern Coke No. 2	22 00 @ 23 00	Coke Bessemer	25 00 @ 26 00

BARS.—All the orders placed were of small size. A considerable inquiry is in the market, and it is expected most of it will result in business within a short time. The quotations on iron and steel bars are unchanged, both of them being worth from 2 35c to 2 50c, half extras, Chicago delivery.

RAILS AND TRACK SUPPLIES.—Sales were only small in the week, as was expected A number of small lots were placed, but no large orders. There is some demand for small lots for both light and standard sections, and this, it is thought, will result in business immediately. Quotations are as follows: Rails, standard sections, $35 to $38; light sections, $37 to $42; splice bars, 2.50c to 2 70c; spikes, 2.75c to 2.85c; track bolts, 3.65c to 3.85c.

BILLETS AND RODS.—The local mills were not sellers, and what orders were placed went to outside mills. The market is about $37 for Bessemer billets, and $45 for open-hearth.

PLATES.—The demand for small lots from store was good, considering that it was holiday week, but very little mill business was done, and only in a small way. We quote tank steel from store 3.20c to 3 40c. Mill shipments, Chicago delivery: Tank steel, 2.80c; shell, 2.95c to 3c; flange, 3 10c; marine 3.20c; fire box, 4c to 6c, according to brand.

STRUCTURAL MATERIAL.—The week was quiet, with no large orders placed and only a few small ones. Sellers are looking forward to a good year, and the prospects for a large tonnage in 1900 is excellent. There are a number of good contracts now being figured on, and others are in sight for the immediate future. Quotations follow: Beams, 15 inches and under, 2.40c; 18 inches and over, 2.50c; angles under three inches and over six inches, 2.50c; three inches to six inches,

2.40c; sheared plates, 2.90c to 3.15c; universal plates, 2.80c to 3c; tees, 2.45c; zees, 2.40c; small lots from store are quoted from ¼c to ½c higher.

SHEETS.—Considering the season, quite a good business was placed last week, although most of it was in small lots. There is a fairly good outlook for future business. The market is firm, and quotations are maintained at 3c to 3.20c for No. 27 black sheets, Chicago, and 7o and 10 for galvanized.

MERCHANT PIPE.—The demand is small, and no large orders were closed last week. The immediate future does not appear to show much in store for mills, but a larger business is expected to come within a short time. Prices are unchanged at 50 and two 10's off for mill shipment on large orders, and 50 and 10 and 5 off on small orders.

MERCHANT STEEL.—Deliveries on old contracts keep up well, but the new business of the week was of small dimensions. A better demand is expected to open up with the new year, and some inquiries have already been received which indicate a good business for January. Smooth finish tire steel is quoted 2.80c to 3c; smooth finish machinery steel, 2.95c to 3.05c; spring steel, 3 65c to 3.75c; tool steel, 7c to 7.50c; special, 13.50c and upwards.

WIRE AND WIRE NAILS.—Holiday week was quiet, with only small sales of wire goods, as was to have been expected. The demand is expected to increase immediately after the first of the year. Makers quote single carloads of wire nails at $3.25 f. o. b. Chicago, and $3.35 for less than carloads. On wire, current quotations are as follows: Plain annealed wire, $3.10; painted barb wire, $3.70; galvanized barb wire, $3 85.

OLD MATERIAL.—There was very little new business placed in the week, and almost entirely in small lots. Dealers are looking forward to a good year, and are expecting a larger tonnage than in 1899. Prices are unchanged and in many cases are only nominal. Dealers' quotations are as follows:

Old iron rails, gross,	$26 00@$27 00	Country malleable	$15 00@$ 6 00
Old steel rails, long, gr.	24 50@ 25 50	Iron axles, net	28 00@29 00
Old steel rails, mixed	20 50@ 21 50	Cast borings, net	10 00@11 00
Relaying rails, gross	30 00@ 31 00	Wrought turnings, net	11 00@12 00
Old wheels, gross	22 50	Iron axle turnings, net	13 00@14 00
Railroad forge, net	25 00@ 26 00	Steel axle turnings	12 00@12 50
Dealer's forge, net	16 50@ 17 00	Mixed country steel, gr	15 00
No. 1 cut mill, net	14 00@ 15 00	Stove plates, net	10 00@10 50
Heavy cast, net	14 50@ 15 00	Heavy melting steel, gr	19 00@20 00
Railway malleable, net	16 00	Old iron splice b., net	27 00

CINCINNATI.

Jan 2.

Rogers, Brown & Co., write: "The transactions of the week have not been numerous or large; though in view of the fact that it was the great holiday week of the year, there has been quite as much activity as could have been expected. The demand for shipments on orders already entered have been constant and urgent, clearly evidencing that pig iron consumption is not affected by the inclement weather. The holiday season in the South annually interrupts the operations of the coal and ore mines and furnaces. The buying facilities of the hands this year were unusually large and their festivities have been in proportion, resulting in a marked curtailment of the pig iron output for the week. There continues a great scarcity of soft Southern foundry grades and Southern gray forge. The Big Stone Gap (Va.) Furnace and the Jefferson (Tex.) charcoal furnace have come into the market, which will afford relief in the supplying of the excellent irons these furnaces produce. There are no elements of weakness, the supply still being inadequate for the general demand. After another week there will be a great many consumers in the market for supplies of various kinds of iron, which will add further strength to the market. It is the opinion of some men of recognized sagacity that pig iron prices will not only be well maintained, but in the early spring will rule higher."

Matthew Addy & Co., comment as follows: "The new year has begun with far brighter prospects than any recent year known to the younger men in the iron trade. It has opened well, for there is a fair inquiry and an entirely satisfactory volume of business. As for December, it was in a way as satisfactory as any month during the year. By this we do not mean to say it was marked by a heavy tonnage or that any advance in price occurred. On the contrary, the tonnage was small and the price at the end of the month was precisely what it was at the beginning of the month, but this very fact is the best demonstration of the strength of the pig iron market that has occurred. In December there was the great smash on Wall Street when many industrial and speculative stocks fell rapidly in value, but there was not a change of a single cent in pig iron. If there had been any weak spots in the market December would have found them. As it was the pig iron market kept the quiet and even tenor of its way and the new year opens with every indication of continued strength and increasing activity.

"It is the general experience that the shut-downs for the holidays were less this year than usual. Our own information is to the effect that the foundries are still as busy as ever and that in parts of the country it is difficult to get castings made on time. The general foundries are overrun with business while the foundries that devote themselves to specialties, that is, concerns in a half way attached to manufacturing companies that do not make their castings themselves, are simply unable to attend to the demands made upon them. The foundries are very much like the furnaces in having orders booked for a long time ahead. There seems to be an impression in some quarters that the furnaces have been able to catch up on deliveries of late. This is not at all the case. The Southern furnaces are carrying over into this year, one and all of them, a very large tonnage which should have been delivered in 1899. They are beginning the year badly behind hand, and if they took no new business it would be some months before their order books could be brought up to date. This fact is a very significant one in estimating the future."

We quote for cash f. o. b. Cincinnati: Southern coke No. 1 foundry, $21.75 to $22.25; Southern coke No. 2 foundry, $20.75 to $21.25; No. 3 foundry, $19.75 to $20.25; No. 4 and gray forge, $19.25 to $19.75; No. 1 soft, $21.75 to $22.25; No. 2 soft, $20.75 to $21.25; Lake Superior coke, No. 1, $24 to $24 50; No. 2, $23.50 to $24; Hanging Rock charcoal, No. 1, $25 to $26; Jackson county silvery, No. 1, $30 to $31; standard Georgia car wheel, $24.75 to $26.25; Lake Superior charcoal, $25.50 to $26.50.

PHILADELPHIA.

Jan. 2.

There is a shade of uncertainty about prices at the moment, more particularly in finished lines. There is still a fair demand for local pig iron, and the peculiarity of the market is that quotations for immediate delivery are somewhat lower than for shipment some distance through the coming year. Quotations this week show no material change, and are about as follows for the standard grades of Northern iron, tidewater delivery: No. 1 foundry, $25 to $25.50; No. 2 foundry, $23 25 to $24 25; mill iron $20.50 to $21. It is noteworthy that during the interval of quietness covering the past few weeks the prices of pig iron have not declined. The fact that furnaces have less iron on hand in proportion to the volume of business than ever before—being less than 1 per cent of the production for 1895—is a strong indication, added to the fact that probably 80 per cent of the output of the first half of 1900 is sold. Consumers' yards, too, are quite bare of iron, and in view of the urgent requests for deliveries right up to the close of the year, it is not likely that lower prices will be made. Steel billets are quoted $37 to $38, with but small sales. While large buyers appear to be waiting for prices to fall the condition of steel works order books is such that producers are very firm. Large contracts may not be placed at once, and it is probable buyers will only cover immediate wants for a time. There continues to be a good demand for manufactured iron and steel, but prices for some products are weaker, owing to competition from the West. The demand for bars is fair, but the trade is quieter than for some time. There is less rush in the plate trade, and the mills are in easier shape. Prices are lower than they were a week ago. There is every indication that the demand for structural material is to continue good all winter. Just now the mills are turning out everything possible, and the call for more material is urgent. For the usual run of orders quotations are as follows: Beams and channels, 2.40c to 2.75c; heavy plates, 2.50c to 2.70c; steel bars, 2.50c to 2.60c; refined bars, 2.10c to 2.20c.

THE Carbon Steel Co.'s plant at Pittsburg is being enlarged so that the annual output will be 100,000 instead of 75,000 tons.

LAKE ERIE ORE RECEIPTS, 15,222,187 TONS.

We gave in our issue of last week a statement of the shipments of iron ore from all upper lake docks in the season of 1899, the total being 17,901,358 tons. Official returns are now available showing the amount of ore received in the past season of navigation, at all Lake Erie ports. This total, like that for Lake Superior and Lake Michigan docks, establishes a new record—being 15,222,187 gross tons, or an increase of 38 per cent over 1898, which with 11,028,321 tons had been the record year. The aggregates of the two tables below, showing season receipts and stocks on dock Dec. 1, are as follows:

Receipts at Lake Erie ports, season of 1899, 15,222,187 tons.
On docks at Lake Erie ports, Dec. 1, 1899, 5,530,283 tons.

The figures we printed last May showed ore on Lake Erie docks at the opening of navigation, 1899, amounting to 2,073,254 tons. Adding to this tonnage the receipts for the past season and subtracting the amount on dock Dec. 1, 1899, shows that the shipments to furnaces since May 1 (including ore taken directly into the furnace yards of the Lorain Steel Co., Lorain, O.; American Steel & Wire Co. and River Furnace, Cleveland; Buffalo Furnace Co., Buffalo, and Tonawanda Iron & Steel Co., North Tonawanda, N. Y.) reached the record-breaking total of 11,765,158 tons. This is to be compared with 9,059,829 tons in 1898, 7,453,648 tons in 1897 and 5,021,146 tons in 1896. Apart from the figures which point very clearly to that conclusion, it is known that the direct shipment of ore out of vessel to furnace yard has been increasing largely, and would be still greater but for the inadequacy of car supply in the summer and fall months. The following table gives the receipts at Lake Erie ports in 1899 and the five years preceding:

IRON ORE ON LAKE ERIE DOCKS, DEC. 1, GROSS TONS.

Ports.	1899.	1898.	1897.	1896.	1895.	1894.
Toledo	186,422	146,568	194,644	115,959	113,132	96,157
Sandusky	23,184	48,500	84,786	59,491	34,375	77,004
Huron	164,480	139,982	230,029	200,075	101,000	147,632
Lorain	337,822	324,034	317,509	231,288	224,264	223,733
Cleveland	1,200,806	1,175,970	1,478,355	1,419,311	1,200,792	1,441,785
Fairport	692,147	719,794	825,312	773,905	605,470	660,980
Ashtabula	1,902,598	1,732,671	1,835,094	1,441,666	1,301,382	1,439,119
Conneaut	468,808	288,101	360,895	275,800	292,468	199,365
Erie	361,335	439,167	484,871	355,222	335,718	454,233
Buffalo	192,681	121,620	111,660	82,267	207,199	94,239
Total	5,530,283	5,136,407	5,923,755	4,954,984	4,415,712	4,834,247

Ashtabula and Cleveland are close together, as was the case last year. Conneaut will do much in the coming year toward closing the gap between it and the leaders and may indeed in two years, if not in one, become the leader among Lake Erie ports. The combined receipts at Erie and Buffalo were about 700,000 tons in excess of those for 1898, mainly due to the increase in the shipments to Eastern furnaces. The table following gives the amount of ore on docks Dec. 1:

IRON ORE RECEIPTS AT LAKE ERIE PORTS, GROSS TONS.

Ports.	1899.	1898.	1897.	1896.	1895.	1894.
Toledo	792,348	414,012	416,438	301,794	260,730	158,384
Sandusky	87,499	136,200	79,792	58,667	12,361	23,043
Huron	263,600	126,755	198,231	226,515	146,442	172,775
Lorain	1,112,946	536,088	355,188	191,445	214,219	150,424
Cleveland	3,222,582	2,645,318	2,456,704	2,313,170	2,312,370	1,614,573
Fairport	1,241,013	912,879	1,068,340	941,446	914,617	976,222
Ashtabula	3,341,526	2,684,563	3,001,914	2,272,822	2,474,791	1,987,722
Conneaut	2,320,696	1,404,169	495,327	327,623	344,967	237,905
Erie	1,309,961	1,092,364	1,311,526	847,849	811,989	624,438
Buffalo, Tonawanda	1,530,016	1,075,975	797,446	545,101	719,742	395,339
Total	15,222,187	11,028,321	10,120,906	8,026,432	8,112,228	6,350,825

The difference between the 17,901,358 tons reported last week as shipped from upper lake ports last season, and the 15,222,187 tons received at Lake Erie docks, is 2,679,171 tons, representing in the main shipments to South Chicago, Bay View and to such charcoal furnaces as can be reached by water. The balance of the 2,679,171 tons is the difference of 1 per cent between mine weights, in which the figures from upper lake ports are given, and bill of lading weights, which are used exclusively in the statements of Lake Erie docks.

An index of the prevailing prosperity in industry and trade is the interest and dividend payments this month, which are reported as the largest ever known. A New York authority figures that interest is payable on $3,246,389,832, calling for $66,006,066. Dividends are due on stocks of a "par" value of $1,637,880,202, requiring $34,747,995. Combined dividends and interest payments are $100,756,061, as compared with $88,661,399 a year ago, $79,201,025 in 1898, $78,381,390 in 1897 and $71,158,290 in 1896. The interest due on government bonds, $5,000,000, has been paid. Taking into account the various securities of banks, trust and insurance companies and other corporations which pay interest or dividends a fair estimate of the January disbursements is $130,000,000.

Received From the Trade.

The Standard Tool Co., of Cleveland, is prompt with its catalogue for 1900. It is 6x9 inches, contains 80 pages, and is attractively printed and illustrated. It is significant of the trend of things in machinery lines that along with its New York office the company gives six foreign agencies, namely in London, Paris, Rousdorf, Leipzig, St. Petersburg and Yokohama. Incorporated in 1881, the Standard Tool Co. has made rapid strides in perfecting its products and extending its market. Standard drills, with straight, taper and square shanks, are given prominence in the catalogue, and following these are illustrations of the company's reamers, chucks, spring cotters, taps, flat spring and riveted keys, milling cutters, and special tools. In a special note attention is called to boring bars and hollow drills for extra long holes, flat drills, three and four groove drills, counter bores and countersinks, routing bits, chucks and spiral coiler for the manufacture of woven wire mattresses.

Among attractive calendars for 1900 are those of Rogers, Brown & Co., Cincinnati; Superior Foundry Co., Little Falls, N. Y.; the Marsh steam pumps of the American Steam Pump Co., Battle Creek, Mich.; the Ashton Valve Co., Boston, Mass.; Stevenson, Field & Co., St. Louis; Berger Mfg. Co., Canton, O. The last named is conspicuous for large date figures, and bears the legend "largest sheet metal manufacturers in the world." The Stevenson, Field & Co. calendar is lurid with the light of molten metal running into a blast furnace pig casting bed.

Catalogue E of the pumping machinery manufactured by the Deming Co., of Salem, O., is devoted exclusively to this company's power pumps for various lines of service. Descriptions and illustrations are given of triplex power pumps, and deep well pumping engines, for operation by steam, gas gasoline or oil engines, by electric motor or water power. There are printed in addition hydraulic engineering rules and tables for estimating capacity, efficiency, required power and speed of pumps. It is suggested that for mill and factory service as boiler feeders, tank supply pumps, or hydraulic pressure pumps, both belt and electric pumps are well adapted, and for mine service the electric pump.

Mr. Swank's View of the New Year.

We have said that the prosperity of 1899 will be continued in 1900. There can be no doubt of the correctness of this forecast, which we mean to apply to all our industries, except, of course, agriculture. The orders already placed give sufficient assurance of this result. Money is still abundant for those who will make a right use of it. The farmers have again had good crops and the railroads are all doing a big business. Our export trade is still growing, although our imports are also growing. In the iron trade it is particularly worthy of note that, not only are we now large exporters of leading products, but the uses of iron and steel are constantly being extended. In the past year steel cars and steel ships and steel buildings called for a surprisingly large share of the total steel tonnage. But prices for iron and steel in 1900 can not be predicted; they may recede. The present situation is sufficiently hopeful without borrowing trouble.—[Bulletin.

Concerning the reported removal of the company's plant to the site recently purchased on the Monongahela river, David E. Park, of the Park Steel Co., Pittsburg, is reported as saying that the new site is simply intended for future improvements, none of which is planned as yet. It is stated that while the present plant is badly crowded, it will remain where it is, and that leases for various portions of the site are being renewed as they expire.

THIRTY YEARS IN THE WIRE INDUSTRY.

Retirement of W. J. Hayes, of Cleveland.

After 40 years connection with the plant of the Cleveland Rolling Mill Co., Cleveland, acquired early last year by the American Steel & Wire Co., W. J. Hayes resigned on Jan. 1 as superintendent of the wire department. About 1870, or 30 years ago, Mr. Hayes took charge of the wire mill of the Cleveland Rolling Mill Co., adding supervision of operations there to his other duties as manager of the steel and rolling mill departments of the works. Thus his large and very successful career as a manager of men and of works nearly coincides with the history of the steel wire industry in the United States. Thirty years ago wire was drawn principally from rods made from the crop ends of Bessemer steel rails, of from .25 to .35 carbon. The full capacity of the Cleveland works, which were the pioneer plant west of Trenton, N. J., was about 10 tons a day. In the interval, while the wire industry has been established elsewhere in the Central West, its growth in Cleveland has been without a parallel,

W. J. HAYES.

and Cleveland today leads all the cities of the world, having capacity for rolling 1,200 tons of wire rods a day and drawing them into wire.

Mr. Hayes retires from service to seek a well-earned rest. In addition to his managerial duties at the Newburgh plant, he has been for a number of years the head of the well known banking house of W. J. Hayes & Sons, Cleveland. It is worthy of note that while he has brought the plants under his supervision up to a high degree of efficiency he has succeeded also in securing the confidence and the loyal co-operation of all the employes in his departments. His son, Mr. Will L. Hayes, has been for a number of years his assistant and now succeeds him.

Grasselli Chemical Co.

The products of the Grasselli Chemical Co., whose general offices and principal works are in Cleveland, are well known in all metallurgical lines. In addition to the Cleveland offices, and the principal works located in the same city, the company's list of branch offices and works includes those in New York, St. Louis, Milwaukee, Olean, N. Y., Beaver Falls Titusville and Boughton, Pa., East Chicago, Ind., St. Paul and Cincinnati. In its announcement concerning its chemically pure acids and ammonia, the company states that it is prepared to furnish these articles in carboys and bottles, and they are guaranteed to meet all requirements, whether for manufacturing purposes or for laboratory work. Sulphuric, nitric, and hydrochloric acids and aqua ammonia are furnished in carboys and 1-lb. sealed bottles. Sulphuric acid is also furnished in 9-lb. sealed bottles, nitric acid in 7-lb. bottles, hydrochloric acid in 6-lb. bottles and aqua ammonia in 4-lb. bottles. These goods, which are in increasing use in analytical work in the laboratories of iron mining, blast furnace, steel works and foundry companies, are for sale at Cleveland, Cincinnati, Milwaukee, New York, St. Paul, East Chicago, Ind., and St. Louis.

1899 A GREAT CAR-BUILDING YEAR.

Returns from all the contracting car builders in the United States, excepting five with a very small output (which we have carefully estimated from information in the office), show that during the year just closing 123,893 cars of all kinds were built. This does not include cars built by railroad companies, the number of which, this year, undoubtedly exceeded any previous year, nor small cars such as cane cars for plantation work. According to the records, these figures represent the largest output for any year. Last year the total output was 105,158 cars, which was the best year since 1890, when 103,000 cars were built. Of the 123,893 cars built this year, 117,982 were for freight and 1,201 for passenger service and 4,710 for street railroads; 1,904 freight, 104 passenger and 296 street cars were for export. Of the freight cars, 10,500 were of steel.

Aside from this year being a record year as to the number of cars built, it is also a record year in the carrying capacity of the individual cars. It would be quite impossible to make any estimate of the increase in the capacity of the average car, or of the increase in the total capacity of the freight cars actually in service, but it is a well-known fact that the increase has been substantial. Another very remarkable incident of the year's car building was the great increase in the number of steel cars turned out. Last year these were 2,700 and in 1899 they amounted to 10,500. During this eventful year the great combination of car building companies has taken place; 13 companies which were actually building cars were combined into the American Car & Foundry Co. The Pullman Co. still remains outside, but has quite recently absorbed the Wagner Co. The Southern Car & Foundry Co., bringing together three car building works, was also formed this year.—[Railroad Gazette.

The Tin Plate Market.

The announcement of the American Tin Plate Co., recently noted, that it would sell for the second quarter of 1900 at $4.65 f. o. b. mill, the price previously fixed for first quarter business, has relieved the tin plate market of the unsettling effect of recent reports of advances and reductions. None of the talk of new mills starting up has come to anything as a market factor. The mill the National Enameling & Stamping Co. is building at St. Louis will only supply the wants of the company and none of the output will go upon the market. Of the general condition of the trade and the outlook *Tin and Terne* says:

"The policy of the American Tin Plate Co., in not selling far ahead, as was done quite universally by the independent mills, will have a very good effect on the trade and will remove a great deal of the uncertainty which used to prevail. Stocks of tin plate are very low all over the country, and as soon as the real consuming season opens up, the mills will no doubt be kept quite busy. Meanwhile improvements are being made at a number of the plants, which will put them in good physical condition, and plans are being prepared for further concentration of mills. It is expected that in a few years the company will have concentrated all its capacity in perhaps not more than three or four large and well arranged plants, which will conduce to much more economical operation than the 35 or 40 variously assorted plants with which it started. The American Tin Plate Co. is now a full year old, and it is somewhat remarkable that there has been so little effort made to compete with it, as it was generally expected that within a year some moderate sized plants at least would have been built or well started."

The Cleveland Iron Mining Co. has secured an injunction against the treasurer of Cuyahoga County, O., to prevent the collection of taxes on iron ore on docks. It is set up that the ore is in transit and therefore is not taxable.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDR TRADES AND IRON AND STEEL MANUFACTURE.

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JANUARY 4, 1900.

THE NEXT DEVELOPMENT IN THE USE OF STEEL.

In respect to new uses for steel the feaure of the ion trade record for 1899 that stands out most prominently is the tonnage required for the building of steel cars. It has been given prominence almost equal to that given for the past five years to the splendid development of the uses of steel in architectural work. The next direction in which a new demand of important proportions will be created is undoubtedly the employment of steel for railroad cross ties. Though metal cross ties are not in use as yet in the United States, it is well known that attention has been directed to their possibilities and that leading steel manufacturers have been conducting investigations and putting themselves in position to be abreast of the movement when it does come. Now and then some apprehension is expressed concerning the supply of timber for cross ties—not that any immediate scarcity is feared; but prices have been advancing and are scarcely likely to recede, and thus the argument against the high first cost of steel ties is urged with less effect than heretofore.

The *Railroad Gazette*, which has long considered that there is no special occasion for agitating metal ties, said recently that in view of the anxiety of engineers concerning the supply and the cost of wood cross ties, it is well enough to be thinking about the development of substitutes for wooden ties. Cast iron it rules out of the account for the reason that if made in the form of a continuous beam reaching across the track it must be unreasonably heavy or it will be liable to break whenever it becomes bound at the center. The pot sleeper, extensively used in Egypt and India, is pronounced a poor contrivance, with its two disks, concaved on the under surface, and connected with a wrought iron spanner. Manufacturers of malleable castings are said to discourage the proposition to use malleable for this service; and thus the choice comes back to steel, concerning which the journal referred to says:

> In our own country steel ties have not yet been received with much favor, even apart from their high first cost. To keep the price within possible limits the metal must be thin; but then its life will probably be seriously curtailed by corrosion, especially about the places where the attachments are made. It is not impossible, nor should we say improbable, that a satisfactory pressed or rolled steel tie will be devised and put on the market before many years; although obviously development in that direction will be arrested so long as the prices of steel are as high as they are now. But it is fairly safe to say that no steel tie satisfactory to American engineers has yet been brought out.

The steel car has been years in coming to its present commanding position; but now that its place is made its advance to popularity promises to be by leaps and bounds. It is not unlikely that the next descent to a low basis for steel will furnish the occasion for pushing the steel tie, and by that time railway engineers will be ready to take up a substitute for wood that promises long life, reasonable freedom from corrosion, moderate first cost and a minimum of mechanical difficulties.

IT is understood that the Naval Affairs Committee of the House will recommend to Congress the repeal of the provision in the appropriation act of the last Congress limiting the price of armor plate to $300 a ton and the clause of the bill of 1897 which says that not more than $400 shall be paid. The question has come squarely to a choice between a fair price for armor plate and the abandonment of plans for enlarged naval armament. The miserable parsimony, not to speak of the open enmity shown in Congress toward the companies which yielded to the Government's solicitations and at enormous outlay went into the business of manufacturing armor, will yet appear in anything but a creditable light. European nations have paid and are now paying higher prices for armor than Congress is willing to pay the manufacturers who took all the risks of such populistic attacks when they established the plants that have put the American Navy so far forward in the race for superior sea armament. Contrast the spirit of the last Congress with the following, from an English contemporary, referring to British armor plate works:

> In order to make sure that we are in the front rank, not only now, but at all future times, as manufacturers of armor, it would be desirable to have an arrangement made under which the goverment would come to the assistance of the armor-plate makers, by defraying at least a part of the cost of carrying out any projected improvement in the character of the armor required for the British Navy. It seems hardly fair to saddle manufacturers with the whole of such cost. Every new process involves more or less a special adaptation, if not a complete reconstruction of existing plant. It is right that private manufacturers shuld be assisted in a serious enterprise of this sort, if it is to be—as it is—for the general advantage of the country. Not only so, but every encouragement should be afforded to improve on existing methods and systems. The use of lyddite in the present South African war proves the value of exclusive systems.

STILL unfulfilled are the prophecies of curtailment of iron and steel exports. The exports in these lines now promise to reach $105,000,000 for the calendar year 1899, as compared with $82,774,958 in 1898; $62,737,250 in 1897 and $48,670,218 in 1896, more than doubling in three years. Yet it is well understood that most of this foreign business was done on a basis of prices much below that of

today, and the course of the export market in 1900 will be watched narrowly for any signs of falling off. In the iron and steel import statistics the items of iron ore and pig iron are of most interest because of the reports of largely increasing receipts of the former at Eastern ports, and the British trade announcements of heavy purchases of Bessemer iron in English and Scotch markets for shipment to the United States last fall. The November imports of iron ore were 62,089 tons against 12,749 tons in November, 1898, and the total for 11 months in 1899 was 560,419 tons as against 163,703 tons in the corresponding period for 1898 and 440,940 in the 11 months of 1897. Pig iron imports do not show the sensational increase that might have been expected from the reports mentioned above. They were 6,066 tons in November, against 2,023 tons in November, 1898; for 11 months, 33,824 tons, against 23,810 tons.

Personal.

Augustus B. Miller, for 33 years superintendent of the Pottstown (Pa.) Iron Co.'s works, was given a reception by 1,000 of his old employes, and presented with a silver tea service, on returning to Pottstown for the Christmas holidays. Mr. Miller recently became superintendent of the Elmira Steel & Iron Co., Elmira, N. Y.

Henry Jeavons resigned on Jan. 1 his position as assistant manager of the Otis Steel Co., Cleveland.

The following changes went into effect in the Reading Iron Co., Reading, Pa., on Jan. 1, 1900: F. C. Smink, to be vice-president and general manager; Simon Seyfert, to be managing director; George B. Harris to be treasurer.

M. D. Chapman, vice-president and assistant treasurer of the Virginia Iron, Coal & Coke Co. and the Virginia & Southwestern Railroad Company, resigned on Jan. 1. He returns to New York to engage with the Moore & Schley banking house, in which he is interested.

Chas. P. Krauth, secretary of the McConway & Torley Co., of Pittsburg, died suddenly at his home in that city.

THE Philadelphia Foundrymen's Association opened its work for 1900 by giving a dinner to members and friends at the Manufacturers' Club, Wednesday evening, Jan. 3. E. E. Brown, of E. E. Brown & Co., Philadelphia, was announced to speak on his experiences abroad, and George H. Hull was expected to read a paper on the pig iron syndicate system of Germany, the pig iron warrant system of Great Britain and the pig iron selling system of the United States, pointing out the advantages and disadvantages of each.

AFTER almost a year of steady work the great dock of the Carnegie Steel Co., or rather the Union Railway Co., at Duquesne is about completed. The big electric coal hoist commenced lifting coal from the barges to the Union Railway cars this week and the Homestead mills are being supplied from this source. Within another week the Duquesne mills will be getting their supply the same way. In a month the cars of the Pittsburg, Bessemer & Lake Erie will receive their "back haul" from this source. The new dock is something of a marvel. It is 1,000 feet long, 70 feet wide and stands up out of the water about 30 feet. On it are three railroad tracks. A line of transports will be established between the dock and all points up and down the river. In this way the Bessemer line will be in shape to compete with all others for Pittsburg trade.—[Pittsburg Dispatch.

BETHLEHEM STEEL CO., whose advertisement appears in this issue, is distributing a handsome calendar mounted on a card about 12x18 inches, with an engraving at the head showing one of its heavy hydraulic forging presses working up a hollow shaft from an ingot of fluid compressed steel. On the twelve monthly leaves appear photogravures of representative forgings produced at the Bethlehem plant, the whole being very effective. An application to one of the company's offices will secure a copy for any one who has not already received it.

Republic Iron & Steel Co.

In a pamphlet just issued by the Republic Iron & Steel Co. for the benefit of its stockholders it is stated that the statistics of the company as to volume of business from May 1, 1899, to Jan. 1, 1900, will be practically as follows:

Tons of iron ore mined,	. . .	502,184	gross tons.
" Coal mined,	. . . . .	87 684	net "
" Coke made,	. . . . .	112 486	" "
" Pig iron produced.	. . .	265 682	gross "
" Muck bar "	. . .	279 662	" "
" Ingots "	. . .	16 023	" "
" Finished material of all kinds produced,	. .	525 951	net tons.

THERE are probably a few people who still follow the devious "cycles" of the Southern Ohio farmer, Samuel Benner. Robert Clarke & Co., of Cincinnati, have brought out the 13th edition of "Benner's Prophecies" adding to the familiar pig iron, hogs and hominy economics of other years, a forecast for 1900. It is not surprising that the farmer economist has become weary at length of regulating in advance the country's financial and commercial movements and that he should now be willing, as he intimates in this last edition, to drop his prophetic mantle on the shoulders of "some enthusiastic and ambitious person," who should "bring the tables of prices up to date and extend the cycles into the far future." The author confesses that the "spirit of prophecy has nearly departed" from him. We learn from the volume just issued that "we are now approaching a down cycle in prices," and that prices for pig iron and many other commodities will incline downward in 1900. The Benner prediction for 1899 was that "the revival of business will end in this year, 1899, and after the month of July general trade will languish, prices will gradually decline, and the times grow worse until after the election in 1904."

GENERAL freight agents representing lines north from the Ohio river and including all north-bound roads out of Cincinnati, Louisville, Evansville and Cairo, met at Indianapolis to discuss iron rates. The uniform rate for iron and steel billets was made some time ago but broken. It is understood, however, that the meeting was harmonious and that a general increase in rates will follow. All shipments of billets in the territory of the Central Freight Association will be affected.

A DECISION has been rendered in United States Circuit Court, Cleveland, in the suit brought by the Brown Hoisting & Conveying Machine Co. against the King Bridge Co. for alleged infringement of patents on ore hoisting and conveying machinery. The court held in favor of the King Bridge Co on the ground that the machine in question had been built prior to the date of the patents of the plaintiff.

THE Pressed Steel Car Co. has just received an order for 50 steel ore cars at a cost of $60,000, which are to be delivered in Ontario during the early part of the coming year. The order is from the Consolidated Lake Michigan Co., which is just completing the Algoma Central Railroad, a line from Sault Ste. Marie, to the company's iron mines in Northern Ontario.

THE Clinton Iron & Steel Co., of Pittsburg, uses as the art subject for its calendar for 1900 a handsome fruit piece—a thoroughly realistic reproduction of red raspberries. The company's Hector and Clinton brands of foundry iron receive marginal mention, being commended for softness, strength, fluidity and uniformity.

THE added blast furnace capacity of the past year was almost entirely old furnaces re-started. Two notable exceptions were the new Lorain Steel Co. furnaces, of 600 tons daily capacity, blown in last summer. Two new 600-ton furnaces of the National Steel Co. are about to start up, and one new 600 ton furnace of Larghlin & Co., Pittsburg. A number of large furnaces are projected but it is not likely any of them will get in blast in 1900.

THE LIFE OF STEEL WIRE CABLES.*

BY PROF. FRANK SOULE, BERKELEY, CAL.

Mr. E. H. Benjamin, secretary of the California Miners' Association, has proposed and begun, in co-operation with the testing laboratory of the University of California, at Berkeley, a series of tests which should prove of great interest and practical use to all persons making extensive application of steel wire cables, and especially to miners who run them in deep mines. Mr. Benjamin is endeavoring to obtain pieces of cable both new, and old and worn, from every deep mine of importance on the Pacific Coast, together with all the data obtainable concerning their manufacture and particular use. Pieces from each sample will be broken in the laboratory before mentioned; and as far as possible the effects of winding around drums or pulleys; of sudden starting and stopping when loaded, of heavy shocks, and of the general wear and tear of the cables, will be ascertained by these tests. The Olsen testing machine of 200,000 pounds capacity, will be used to break the cables, and the rupturing force, in different instances, will be applied slowly and also rapidly, in order to make the tests comparable as far as possible with the practical use of the cables themselves. All information and data available should be obtained for each specimen sent to the laboratory, the name of the manufacturer, the date of making, strength of cable when new and unrusted, as well as the circumstances and conditions of the practical use of the cable. Having this information before us, we shall be able to tell, approximately at least, the effects of age, rust, wear and tear, shocks, etc.; and perhaps be enabled to draw the line of limitation beyond which it would be no longer safe to use a cable of known manufacture. Moreover, by means of such tests we may, perhaps, be able to recommend worn cables for other uses, less severe in character, thereby prolonging the life of their effective usefulness.

When we consider the great number of miles of steel cable now in use, and of the greater number constantly being manufactured, we can see that the satisfactory answers to our questions will be of great importance to miners, as well as to engineers generally. In order to make the record complete, and the results satisfactory and reliable, the fullest data should in every case accompany the samples of cables sent to be tested. Unfortunately, thus far there have been few cases in which the data given were considered ample and complete. But from the small number of tests already made we may, perhaps, be justified in drawing a few general conclusions: (1) That the effect of ordinary rust on the strength of steel wire cables is not as great as has commonly been supposed, and that the rusting may be almost entirely prevented by carefully coating with tar, etc.; (2) that the weakening effect of bending the cable around a drum, of large size compared with the diameter of one cable, is almost nothing; (3) that the cable which exhibits a great deal of wear on its exterior surface, and is apparently much diminished in strength, is not nearly as much weakened as is commonly supposed, and retains a large percentage of its original strength, particularly when stressed by gradually increasing loads, applied without shock.

These conclusions are no more than provisional, having been drawn from a small number only of tests, and may be greatly modified in the final report. A full account of the samples, tests and conclusions finally drawn therefrom will be published by the American Institute of Mining Engineers; and also as a bulletin of the University of California. The latter will be distributed through the medium of the California Miners' Association to all persons who are interested in the subject.

The data particularly desired are: 1. A descriptive number on the sample. 2. The size of the cable when new, and the material. 3. The name of the manufacturer, and the date of making. 4. The strength when new, as tested, with the circumstances of the test. 5. The time when first used. 6. The length of cable in use, or under stress. 7. The conditions and circumstances of use of each sample. 8. Diameter of sheave. 9. Diameter of drum. 10. Speed of hoisting, i. e., feet per minute. 11. Speed of lowering. 12. Angle of shaft. 13. Number of daily trips. 14. Weight of load on sample cable. 15. The lubricant used. 16. Circumstances as to sudden load, shocks, etc.

*Prepared for the California meeting of the American Institute of Mining Engineers.

THE IRON AND STEEL STOCK MARKET.

Denison, Prior & Co., in their weekly letter on the iron and steel stocks say: "To our minds the steel stocks are the strongest securities on the New York Stock Exchange at the present time. Already they have had a considerable advance in the past few weeks, as notably that of 15 points in Steel and Wire since the middle of December, and we believe they will go still higher. There is every prospect of dividends on the common stocks of some of the companies early in the present year. The preferred stocks are closely held, as is evidenced by the fact that there are few transactions in them. Frequently a day or two passes with no sales of National Steel preferred and there is a similar condition in Steel & Wire and others, indicating that the stocks are in the hands of investors rather than speculators. We believe that the preferred stocks will command the confidence of investors more and more as they develop and that they will be steadily absorbed and put away in tin boxes for their dividends. There is no doubt in our minds that these stocks can continue to pay their dividends regularly, even through a dull period, unless, of course, that period should come on within a year, before the companies have had time to accumulate a surplus for the protection of the preferred issues. We believe their policy will be in line with such protection for the preferred, so that the dividends on the latter may be maintained without fail, year in and year out."

Fluctuations of the Week and the Year.

The table below shows the changes in the iron and steel stocks in the week ending Jan. 1, also the high and low points of the year:

Name.	WEEK.				YEAR.			
	Open	High	Low	Close	High.		Low.	
Am. Car & Fdy	12¾	13⅞	12¾	13¾	27⅞	May 25	10⅝	Dec. 22
Am. Car & Fdy pr.	55	58½	55	58¼	68⅜	Sept. 7	51	Dec. 22
Am. Steel & Wire..	43	49	43	48½	72	May 4	32	Dec. 18
AmSteel & Wire pr	87½	90⅛	87	89	106¾	Mar. 13	84	Dec. 22
Am. Steel Hoop.....	40¾	43	40¾	42½	48¾	Nov. 28	24	May 24
Am. Steel Hoop pr	79	81	79	81	86¾	Sept. 14	70	May 13
Am. Tin Plate.....	26	28½	26	28½	52¾	April 4	20	Dec. 11
Am. Tin Plate pr..	77	80	77	80	99½	Feb. 8	74	Dec. 22
Col. Fuel & Iron...	38½	44½	38	44	64	Sept. 11	30½	Feb. 8
Federal Steel.....	45½	53⅞	45	53½	75	Apr. 3	39¾	Dec. 18
Federal Steel pr....	69¾	74¾	68¾	74¾	93⅝	April 3	67	Dec. 22
National Steel.....	37	43¾	37	43¾	63	April 24	31¾	Dec. 19
National Steel pr..	86½	93	86½	92⅞	99⅜	Aug. 11	85	May 15
Pressed Steel Car..	53	55½	53	55½	61	Aug. 14	44¾	June 1
PressedSteelCar pr	84	86	84	85	91	Sept. 7	75	Dec. 18
Republic Steel.....	18½	20¾	18½	20½	33⅜	Sept. 6	16½	Dec. 19
Republic Steel pr..	63	65½	63	65	79	Aug. 29	60⅛	Dec. 19
Tenn. Coal & Iron	78½	84¼	78¼	83⅞	126	Sept. 11	36	Jan. 14

THE Benskine Mfg. Co., of Canton, O., reports an increase of 150 per cent over the business of 1898 and during the present year will expand its foreign trade. The wood and leather fillets manufactured by the company are sold throughout the

United States, Canada, England, Germany and Scotland. The company's "Perfect" leather fillet of which an illustration is given herewith, is constructed with curved sides, geometrically correct, and forms a perfect arc of a circle when applied. It may be applied on single or compound curves and on straight work with a single operation, without tacking, clamping, or the use of the mitre box.

IT is announced that Thomas A. Orr became a member of the firm of Robinson & Orr, Pittsburg dealers in iron and steel, with the beginning of the year and the partners now are J. F. Robinson, Robert A. Orr and Thomas A. Orr.

FLANGE WEAR AND CHILL OF CAR WHEELS.

The increased demand for charcoal iron from car wheel foundries has been commented upon recently, particularly in view of the thermal tests that are now required by some railways. The chilling quality of the iron in its relation to the thermal test, is also a matter that has called for attention in the selection of iron for this work. A correspondent of the *Railroad Gazette* makes this interesting contribution to the current information on the subject:

"The cause of increased flange wear of car wheels in recent years, noted in your issue of 22nd inst., is not difficult to discover—at least, one cause is plain enough. In the early days, when cold blast charcoal iron was exclusively, or largely, used in the mixture, the metal was far more sensitive to chill; that is to say, a soft gray iron, with coarse granular fracture and dark color, would often chill, in a standard chill sample one inch deep. No such iron can be obtained now for making car wheels This iron was rich in carbon and poor in all other elements, and made an ideal car-wheel metal. The chill was almost as deep in the throat as on the tread, while the plate of the wheel remained gray and soft. By the aid of chemistry, synthetic alloys of iron, carbon, silicon, manganese, etc., analogous to the cold blast charcoal irons, are now

made from hot blast coke (and to a small degree warm blast charcoal) irons, but they are not identical therewith. The same depth of chill may be obtained, but at the expense of the softness and ductility of the gray portion of the wheel. In order to meet the 'thermal test,' it is necessary, usually, to reduce the chilling quality of the metal, and while the average wheel is still chilled upon the tread to a sufficient depth to withstand long wear, the chill in the throat of the wheel is often deficient.

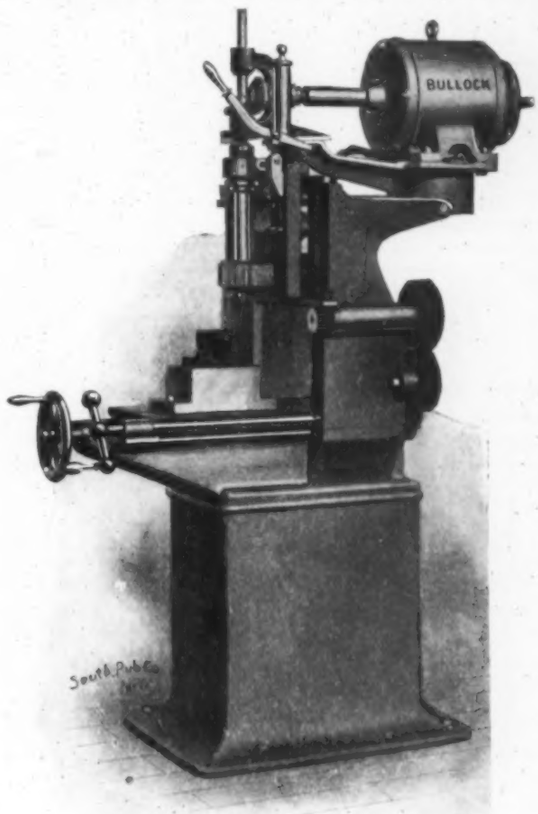
"The cut herewith shows a section of a wheel perfectly chilled, and upon this I have drawn a line to indicate the way the chill often runs out in the throat of modern car wheels made from hot blast iron having the chilling quality imparted by admixture with white iron, wrought iron, steel scrap, 'washed' metal, or other means. An examination of the scrap pile in any car wheel works will, I think, bear out these observations. The paucity of chill in the throat of the wheel accounts, in my judgment, in part, at least, for increasing flange wear. If it were practicable to cast the wheel flange up the chill in the throat would be as deep as upon the tread, even with present mixtures, but this introduces other troubles, such as air holes in the flange."

W. A. Jones Foundry & Machine Co. Additions.

The W. A. Jones Foundry & Machine Co., 55 to 59 S. Jefferson st., Chicago, manufacturer of all classes of power transmission appliances, has just bought the plant of the old Chicago Steel Co., located at the intersection of North ave. and the Chicago & Northwestern R. R. Co.'s tracks. This tract comprises about 1½ acres of land, having a railroad frontage of 582 feet and a frontage of 240 feet on North ave. It contains several substantial brick buildings, which will be remodeled to suit the company's requirements for its particular line. Mr. Jones informs us that for the third time in nine years since the company started, it has outgrown its quarters, and that it now intends to operate its new acquisition in connection with the present plant, where it now has 72 feet by 150 feet, occupying two floors. As soon as the company can get in shape, it intends to add to the present business the manufacture of machine tools for the production of pulleys and rope transmission sheaves at a minimum cost, this machinery applying to both foundry and machine shop. It is at present building two pulley lathes with a capacity of 54 inches which are entirely different from anything heretofore put upon the market. The company is in the market for an eight, 10 or 12-foot boring and turning mill.

AN ELECTRICALLY DRIVEN PROFILER.

The direct application of electric power to a profiler, without intermediate belting is difficult, since the distance between motor and spindle by reason of the constant shifting of the carriage. To overcome the difficulty of a constantly changing length of shaft, the Bullock Electric Mfg Co., of Cincinnati, places the motor upon a revolving base, and connects the motor and spindle by a splined shaft and sleeve. The



shaft sliding within the sleeve allows for the variable distance between motor and spindle. The motor is described in the company's bulletin No. 7,535.

THE *Scientific American* mentions the case of a highly polished screw cutting lathe becoming completely covered with a coating of rust under conditions which appeared to preclude all possibility of the presence of dampness. Investigation, however, revealed the fact that for several days prior to the discovery of the oxidation a gasoline furnace had been in prolonged use by some plumbers for the purpose of melting pots of lead for making leaded joints. This furnace had been placed directly upon the floor, 10 or 15 feet from the lathe, with no chimney or other means of ventilation. The water vapor generated by the combustion of the gas from the gasoline found a most approved condenser in the polished steel of the lathe, the surface of which it immediately converted into rust. The use of ordinary illuminating gas in an unventilated building will cause a certain amount of vapor to condense in a similar way.

THE Marion Steam Shovel Co., Marion, O., sends to the trade an artistic banner calendar in which the conspicuous figure is the genius of invention, drawing attention to the Barnhart steam shovel that is represented as extending across the continent. Underneath is the legend "Used in all quarters of the globe." The calendar sheets are interleaved with views of the Barnhart shovel in various lines of service.

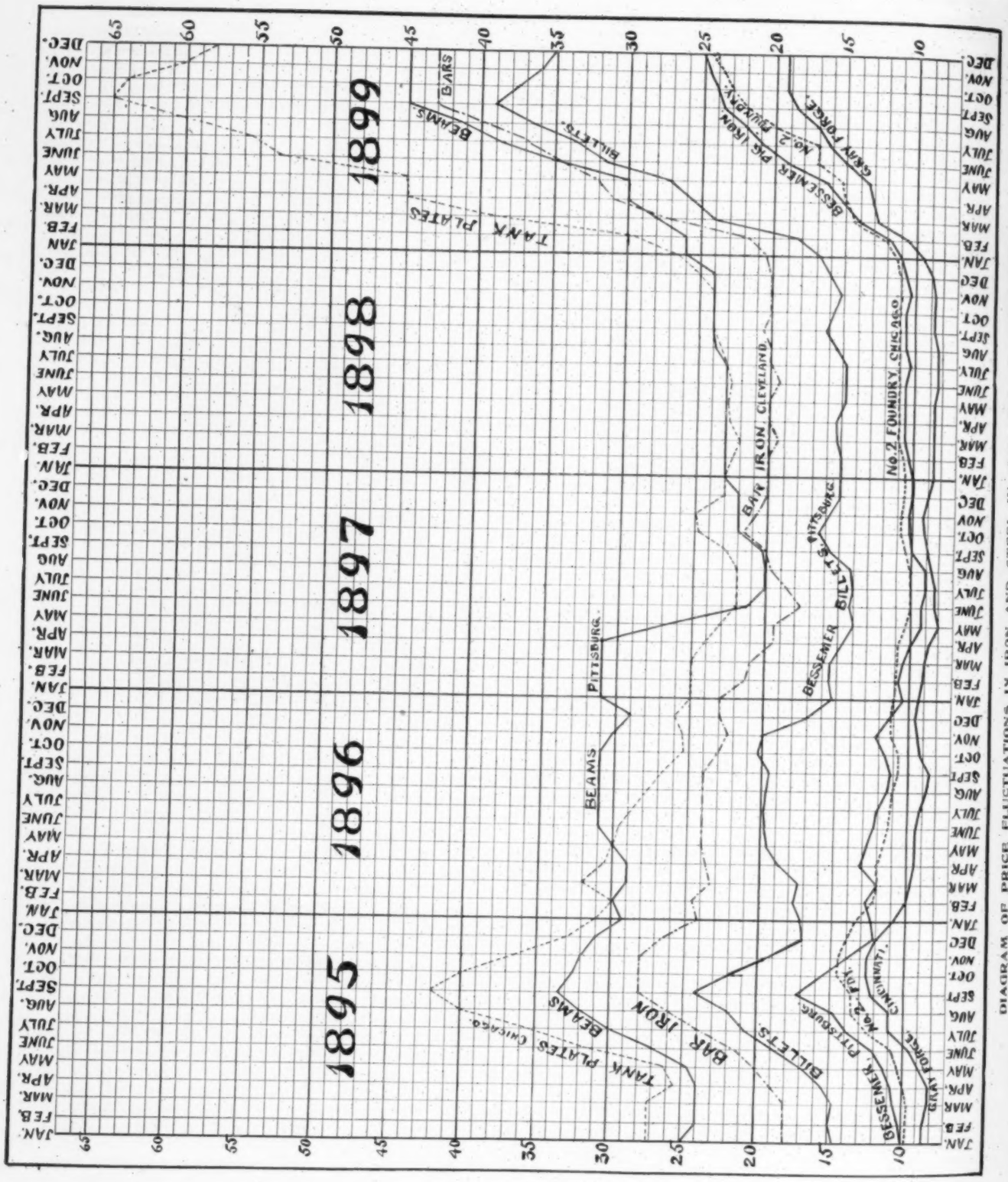


DIAGRAM OF PRICE FLUCTUATIONS IN IRON AND STEEL IN 1895, 1896, 1897, 1898 AND 1899.

1899 IN THE IRON TRADE.

In our review of the iron trade of the United States in 1898, one year ago, the statement was made that the books had been closed on the greatest year's business ever known. It was added that the iron trade "enters upon 1899 in the confidence that yet greater things are in store." That expectation was fully realized; but many things not expected came also. No living man foresaw one year ago to what length the advance in prices, then about a month old, would carry every department of the trade. None would have dared predict that certain blast furnaces and rolling mills idle one year ago and now active would ever be in operation again. In no other year was there so great capacity employed in the production of iron and steel. So rapid and sensational was the expansion in demand for these products that within a few months trade literature, that had teemed with articles pointing out that home requirements could never again equal home production in iron and steel, gave equal prominence to warnings against the pace at which advances were made in view of a home demand out of all proportion to the ability of effective furnace and mill capacity to care for it.

The year 1899 will be remembered as the one in which the consolidation movement, begun in the second half of 1898, was carried to a length scarcely considered within the probabilities twelve months ago. On this phase of the year's developments more is said in the extended reviews which follow.

Generally speaking the course of prices was steadily upward through nine months of the year, the highest point in most lines being reached in the early part of October. Bessemer pig iron is an exception, as is also the Chicago market for other varieties of pig iron. The advances in finished lines were attended with some excitement; indeed, buyers, by their clamorous demands, often pushed prices upon themselves. Since October, there has been a settling of prices for most finished material products, bringing them more closely in line with the basis for raw materials, from which they cut loose when mills began asking premiums for early deliveries. Some of the records of production, which are all prodigious, may be quite closely approximated, though no official statistics will be available for some weeks. The *Bulletin* of the American Iron and Steel Association puts the output of coal at 200,000,000 tons, for the first time exceeding that of Great Britain. Iron ore production was probably well beyond 25,000,000 tons, in view of the 18,500,000 tons shipped from the Lake Superior region. Pig iron production, as officially reported, was 6,289,167 tons for the first half of the year. In the second half the increase has been marked, so that the year's total is likely to be above 13,500,000 tons. The *Bulletin* estimates the production of steel of all kinds at more than 10,000,000 tons and of steel rails at more than 2,500,000 tons. At the beginning of the year there were 195 blast furnaces active, with producing capacity estimated at 235,528 tons. On Dec. 1, the number active was 283 and the estimated producing capacity 289,448 tons. The production of Connellsville coke was the largest in the history of that region, being in excess of 9,000,000 tons. At the beginning of the year the weekly output of Connellsville coke was estimated at 159,000 tons; at the middle point of the year 180,000 tons; in the closing week of the year 202,000 tons. This gauges well the expansion of pig iron production in the Central West.

The producers of Lake Superior iron ore were alone in getting no benefit from the advances of the year, on their product for 1899. But they have sought to compensate themselves in a measure by advancing the price from a base of $2.95 for old range Bessemer ores in 1899 to $5.50 in 1900, and already sales of about 6,000,000 tons of merchant ore have been made for 1900, or 75 per cent of the independent producers' output, reckoning the total for 1900 at 20,000,000 tons and putting the amount mined by furnace and steel works companies for their own use at 12,000,000 tons. The advances in pig iron and in finished material have brought large profits to producers, but not such profits as might be inferred from consulting a table of prices. Relatively a small part of the tonnage of the year brought the producer the top prices, or any approximation of them. For example, it is probably true that the average price at the furnace of iron shipped out of the Mahoning and Shenango valleys in the last quarter of 1899 was between $15 and $16, whereas today Bessemer pig iron is $24 at furnace, No. 2 foundry iron, $22, and gray forge $21. But here, too, the benefit of the advance is already guaranteed for the future, since the output of Bessemer iron is practically all sold for six months ahead, and that of foundry iron very largely, for the same period. Reported pig iron stocks in the United States decreased from about 500,000 tons at the opening of the year to 125,000 tons at the close.

Price Fluctuations of the Year.

The diagram on page 12 shows in a graphic way the fluctuations in prices of representative products in the past year, also in the four years preceding. The price lines are plotted from computations of monthly average prices. They do not necessarily show, therefore, the highest price reached in any week. For 1899 this appears in a table given below. The diagram gives opportunity for making comparisons between the sharply angling lines of 1899 and those of the effervescent advance of 1895. In marked contrast are the low-lying lines of the latter part of 1896 and the two years following, none of them making any great departure from the horizontal. The prices are all given for tons, beams, bar iron and tank plate being in net tons. The table of monthly averages from which the lines for 1899 were plotted is as follows:

AVERAGE MONTHLY PRICES OF IRON AND STEEL PRODUCTS IN 1899.

	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Fdy., Chicago	11.25	12.00	14.25	15.00	15.25	17.00	17.00	20.00	22.00	23.00	23.50	24.50
Gray Forge, Cincinnati	9.50	10.50	12.75	13.00	13.25	15.00	16.25	17.00	18.50	19.25	19.25	19.25
Plates, Chicago	26.50	29.50	39.00	45.00	45.00	53.50	55.50	60.50	65.00	64.00	60.00	58.00
Billets, Pittsburg	16.75	18.25	24.00	25.50	27.00	31.50	33.50	36.50	39.00	37.50	36.00	35.00
Bessemer Pig, Pittsburg	11.00	11.75	14.00	15.15	16.25	19.00	20.75	22.00	23.50	24.00	24.50	25.00
Beams, Pittsburg	26.00	26.00	28.00	30.00	30.00	35.00	38.75	41.25	45.00	45.00	45.00	45.00
Bar Iron, Cleveland	20.50	21.75	27.50	31.00	32.00	34.75	36.75	39.75	43.00	43.00	43.00	43.00

In the table below the prices of the same products at the beginning and end of 1899 are given, and for the lowest and highest weeks of the year. It will be seen that in all cases the opening figures were also the lowest for the year. In some cases the highest prices of the year continued to the close. Another finished product whose advances are interesting is steel rails, which opened the year at $18, Pittsburg, and advanced by very conservative steps to $35 in November, this price being still maintained. Steel bars opened the year at 1c, Pittsburg, advanced to 2.50c in the early part of October, and receded to 2.25c at the close. No. 28 black sheets began the year at 1.90c, advanced to 2.50c in March, 2.95c about July 1, and 3.20c about Oct. 1, afterward falling to 2.95c. Tin plates were $3 for 100 lb. coke tins at the beginning of the year, and at the close $4.65:

	Jan. 1, 1900.	Lowest Week, 1899.	Highest Week, 1899.	Jan. 1, 1900.
Local No. 2 Fdy. Iron, Chicago	$11.00	$11.00	$24.50	$24.50
Gray Forge, Cincinnati	9.00	9.00	19.50	19.50
Tank Plate, Chicago	26.00	26.00	65.00	56.00
Billets, Pittsburg	16.65	16.65	39.00	35.00
Beams, Pittsburg	26.00	26.00	45.00	45.00
Bessemer Pig, Pittsburg	10.90	10.90	25.00	25.00
Bar Iron, Cleveland	20.00	20.00	45.00	43.00

THE CHICAGO IRON TRADE IN 1899.

Much that is memorable occurred in the year just closed. In reviewing its history the first thing that strikes one is the remarkable change in price levels nearly every commodity having advanced, from January to December, over 100 per cent, while in some cases the increase was much greater than this. The year was pre-eminently one of combinations and consolidations, the amount of capital involved in the changes made being enormous, and the changes affecting an extraordinary number of plants, including some of the oldest and largest in the country. In fact, more trade history was made than in any previous year.

At the opening of the year a majority of those in the trade believed that 1899 would show a larger business and higher prices than had been the rule for a long time past, and it was confidently expected that many records, especially concerning tonnage, would be broken. These expectations were not disappointed, as the output exceeds by a large amount that of any previous year, and prices advanced to a higher level than for many years past.

Mills and furnaces generally, as early as January, were sold well into the future, the products of many of them having been taken for three to five months ahead. It has been the rule throughout all of the year, that prompt deliveries on new orders were difficult to obtain, as nearly all producers have kept their order books filled from three to six months ahead

DIAGRAM OF PRICE FLUCTUATIONS IN IRON AND STEEL IN 1895, 1896, 1897, 1898 AND 1899.

Consumption has led production in almost every branch of the trade, and many buyers who were not weatherwise enough to provide for the avalanche of business were not able to make the output their trade demanded, because of inability to secure the necessary material.

It is noteworthy, in view of the fact that the demand for many kinds of material has been greater than the production, that prices have not gone even higher. Producers were evidently in fear of a "sky rocket" boom, and that the resultant fall in prices would bring them back to the low levels of previous years, after a comparatively short period of inflation. As a consequence there was a general effort made, especially during the early part of the advance, to allow values to increase only to a point fully warranted in view of the actual and prospective increases in costs. This conservative course has had and is having its reward, as material has not advanced enough to scare off buyers, but on the contrary the increases in values have only been sufficient to cause increased confidence in the future of the iron business. The market has been in such condition, as regards costs and selling prices, that producers can all make a profit and at the same time can secure all the business necessary to keep their plants in full and constant operation.

Consolidations and Other Changes.

Among the changes occurring in Chicago territory were the sale of the Iroquois furnace by the Iroquois Furnace Co., composed principally of Pittsburg people, to the Iroquois Iron Co., which is controlled by Rogers, Brown & Co., who became the selling agents of the furnace; the purchase of the Calumet Iron & Steel Co.'s plant at South Chicago by the South Chicago Furnace Co., controlled by Pickands, Brown & Co., who repaired and put in blast the Calumet furnace, and sold the balance of the plant to the Republic Iron & Steel Co., to be wrecked or removed; and the lease of Minerva furnace, at Milwaukee, by the Minerva Pig Iron Co., who made Matthew Addy & Co. sales agents for the furnace products.

The combinations or consolidations effected in the year include the National Steel Co., with a capital stock of $59,000,000, controlling several important furnaces and steel plants in Ohio and Western Pennsylvania, and various iron mines; the American Steel Hoop Co., capital $33,000,000, controlling furnaces and the annual production, at various plants, of 400,000 tons of hoops, bands, cotton ties, bars, skelp, etc.—the principal products being hoops and cotton ties; the Republic Iron & Steel Co., with a capital of $55,000,000, and owning iron mines, blast furnaces and rolling mills, with an annual capacity of 300,000 tons of pig iron and 1,000,000 tons of iron and steel bars and shapes, plates, sheets, spikes, bolts, etc., the principal product being bar iron; the United States Cast Iron Pipe & Foundry Co., with a capital stock of $24,000,000, controlling about 75 per cent of the cast iron pipe output of the country, its plants having an annual capacity of about 450,000 tons; the National Tube Co., capital $80,000,000, owning blast furnaces, rolling mills and iron and steel wrought pipe works with an annual capacity of 1,200,000 tons; the American Car & Foundry Co., capital stock $60,000,000, owning several of the largest car manufacturing plants of the country, and having an annual capacity of 86,500 freight and 500 passenger cars, 820,000 wheels, 125,000 tons of castings, 30,000 tons of pipe and 90,000 tons of bar iron. In addition to the above the American Steel & Wire Co., which was formed in 1898 by a consolidation of a number of wire manufacturing concerns, was largely increased in size in the early part of 1899, taking in nearly all the wire drawing plants of the country, as well as iron mines, blast furnaces and steel works. Its capital was increased from $24,000,000 to $90,000,000. At the present time this company practically controls the wire making business of the country.

Consumption of iron and steel and their products has increased very largely in the Chicago district, averaging fully 25 per cent greater than in any previous year. Enlargements of and additions to consuming plants have been frequent, and a number of new plants, some of them of considerable size, have been built, while others are projected. Some increase in productive capacity of mills in this territory has been attained, by various improvements and enlargements, and with further additions which have been planned a considerably larger output will be had during the present year.

Pig Iron.

The year opened with furnaces sold several months ahead, and while the demand was not immediately large it was sufficient to make the market very firm, so that advances in prices over the level of the previous year were expected almost from the first. Before the end of January an advance had been made of 50 cents a ton on Northern and $1 on Southern irons, part of the latter being due to advances in freight rates from the South. Steadily and without a break quotations advanced from January to December, remaining stationary the last two months of the year on a basis of $23.50 for Northern No. 2 foundry, or a little more than 100 per cent increase in value. Quotations on Southern irons have increased in about the same proportion, part of the advance being covered by higher freight rates, these having gone from $3.10 a ton in January to $4.35 in December. Foundry iron furnaces in this territory have been pushed to their fullest capacity throughout the year, as the consumption by local and nearby users has been much greater than ever before. The tonnage of foundry irons shipped into the Chicago district by outside furnaces, both Southern and Central Western, has increased very materially. Three furnaces in this territory, that were previously out of blast, were blown in in the year; the Spring Valley, Wis., furnace, in May; the Minerva furnace, at Milwaukee, in June, and the Calumet furnace, at South Chicago, in July. With the exception of short shutdowns for repairs, relining, etc., the other furnaces in this district have run continuously.

A feature of the year's business was the fact that many buyers found themselves mistaken, in some cases more than once, as to the amount of iron they would need, and made their original purchases too small, having to increase them long before they thought it would be necessary for them to buy again. In fact, the tonnage of castings made in 1899 has been much larger than was expected at the beginning of the year, and many foundries have had to increase their capacity as a result, while the number of new foundries built has never been exceeded in any previous year. Buyers early sought to supply their wants for the entire year, and in some cases for the first three or six months of 1900. In March and April, when iron was selling on a basis of $14 50 and $15 for No. 2 foundry, predictions were made that $20 iron would be reached before the end of 1899. The idea of higher prices was impressed on the minds of many consumers, who sought, by purchasing for delivery for six to 12 months ahead, to protect themselves. Furnaces were not at all anxious to sell for so long ahead, but nevertheless did so, to a good many buyers. An unusual feature was the large tonnage taken in the summer months, when ordinarily buying is light. Some of the heaviest purchasing of the year came in that season. This, with the furnaces all sold for months ahead, caused prices to advance from $17 for Northern No. 2 foundry June 15 to $22.50 September 15. Buying was heavy during the fall and until December, when business was light, as is usual at this season, consumers preferring not to make purchases just before the annual stock-taking. Arrangements have been made for a considerable increase in pig iron production in this district, and will probably be consummated before the end of 1900. The Illinois Steel Co is building two new furnaces at its South Chicago plant; the South Chicago Furnace Co., now operating one furnace, the Calumet, is arranging to add another; and the Iroquois Iron Co. has plans made for an additional furnace at South Chicago. This additional furnace capacity, so far as it will produce foundry iron, is more than offset, however, by enlargements which have been made or are projected in foundry capacity in the district. The most important project now being considered involves the erection of a large cast iron pipe plant, which it is planned to build at a suburb of Chicago this coming year.

Finished Material.

Chicago is rapidly increasing in importance as a market for finished iron and steel, and in 1899 the increase in the sales through this city was fully 25 per cent over the business of any previous year. The demand for most kinds of material was fairly steady throughout the year, nearly every month showing large sales and a gain over the previous month. At the same time prices advanced steadily, until the last few weeks of the year, when they remained stationary for most varieties of iron and steel, for special reasons falling off

slightly on one or two shapes. There were few pooling arrangements in the year, the necessity for these having been obviated by the naturally strong market and by the formation of the various consolidations among producers. That makers of material were conservative in their views and were not anxious or willing to put prices too high, is evidenced by the course of quotations on various forms of material. Prices for rails and beams were advanced steadily but gradually, being in December about 75 per cent higher than in January. These prices are controlled by agreement of mills. On other rolled products, for which the market is an open one, as in billets, plates and bars, the natural demand caused advances from January to December of from 100 to 120 per cent. The large sales of rails made in the latter part of 1898, with the considerable business taken from time to time during 1899 have kept the rail mills running full. Rail buying for delivery in 1900 was done largely in September and October, the bulk of the business being closed on a basis of $33 Chicago. The last of October prices were advanced to $35, and considerable purchases were made at this figure. The output of the rail mills for 1900 is now almost entirely taken. The bar iron and steel markets are now practically controlled by four or five companies, the recent consolidations having taken nearly all the independent producers out of the field. The business of the year has been larger, in this territory, than in any previous year, and has been done with prices advancing nearly every month until November; since that time the market has been stationary. In structural material a very large demand was had, the mills keeping well sold ahead all the time. Building operations have been large in the West, and very many bridges have been built by railroads and municipalities. The local demand has been good, a large tonnage having gone into railroad work of various kinds. In billets and rods there is comparatively little general or open business in this market. The production of the local and Joliet steel plants is almost entirely taken by the same mills for material of higher finish, and by the Western wire mills. The weekly quotations are consequently largely nominal. A very heavy business was done in plates of various kinds. The demand was much larger than in any previous year, and came from all classes of consumers, railroads using an especially large tonnage. The course of prices was upward from January until September, when, owing partly to the fact that they were then above the level of those of other products, and partly because some mills anxious to secure business made large concessions, they dropped materially. The total gain from January to December, however, was over 100 per cent. In merchant steel, sheets and wire products the market followed the general trend of other materials, and the sales in Chicago territory increased largely over those of the previous year. Sheets followed plates in reaching the highest point in September, and in falling off from the prices attained then, and largely for the same reasons.

Old Material.

Probably the most important event of the year, to dealers in scrap iron and steel, was the formation of the Republic Iron & Steel Co., thereby consolidating a large number of the most important buyers into one. It was at first feared that this would have a serious effect on the market in that this one buyer would be able to control prices and effect purchases at its own figures. Undoubtedly this had been somewhat of a restraint on the market, but it has not been as serious as was feared, under the strong conditions prevailing. A striking feature of the year is the large tonnage of old rails offered by railroads, and the prices secured for them, these being in many instances higher than the cost of the new rails which displaced them, so that the roads actually made a profit in exchanging old rails for new. Advances in prices of old material have been most remarkable. Old iron rails, for instance, have increased in value nearly 250 per cent in the year. There have been more fluctuations in the values of old material than in almost any other form of iron and steel, but the increases have been fairly steady throughout the year. The tonnage of business in this market has shown a considerable increase, reaching probably 25 per cent over that of the year before.

The range of prices in the year is shown in the following table of average prices for each month on the leading forms of iron and steel. It does not show necessarily the highest or lowest prices touched, but the average, month by month, as computed from weekly reports:

AVERAGE MONTHLY PRICES OF IRON AND STEEL, CHICAGO, 1899.

	Jan.	Feb.	Mch.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
L. S. Char. Ir'n	11.50	12.75	16.50	17.00	17.00	19.10	21.00	22.75	24.00	24.00	25.50	25.50
Northern No. 2 Fdry	11.25	12.00	14.25	15.00	15.25	17.00	19.00	20.00	22.00	23.00	23.50	23.50
Southern No. 2 Fdry	11 3	12 75	14.50	15.25	15.50	16 90	18.65	19 40	21.25	21.65	21.85	22.00
Bar Iron	21.75	24.00	27.50	31.25	32.50	35.60	37 00	38.50	44.75	46.00	47.00	47.00
Rails	19 75	23.00	24 00	25.25	25.00	28.50	30.50	31.00	32.00	33.50	35.00	35.00
Tank Plates	26.50	29 50	39.00	45.00	45.00	53.50	55.50	60.50	65.00	64.00	60.00	58.00
Billets	17 75	19.50	2 .20	25 50	26.50	31.00	32.25	34.50	38.25	39.00	.....	37.00
No. 27 Sheets	40.00	40.50	48.00	55 00	57.00	59.60	61.50	62.50	66.00	66.00	61.00	60.00
Old Iron Rail	13.00	13 50	15.75	17.50	18.50	17.75	18.25	21.10	24.50	31.50	31.00	31.00
Old Wheels	11.50	12.50	14.75	6.50	16.50	15.25	15.50	15.50	18.00	21.00	21.75	23.50

PITTSBURG IRON TRADE IN 1899.

Foremost among the things which will make the year 1899 famous in iron and steel history will be the very high prices, reaching a maximum in the third quarter, but beyond this there has been much more in the year to make it one of surpassing interest. The year saw the practical operation of the recent iron and steel consolidations, much developing as regards their policy and prospects. The tonnage of the year has easily been a record breaker in all lines, while there is no prospect, and scarcely a possibility, of a collapse such as has characterized previous booms where the advance in prices was not so great.

The Pittsburg district has had its full share in the general prosperity of the iron trade. Its blast furnaces, steel works and rolling mills have been forced most of the time to their fullest capacity, and have made excellent tonnages. The records in most cases would have been still better had it been possible to secure all the raw material and labor desired. The leading interest locally has started during the year additions which will considerably increase its tonnage. The wire interest has decided to concentrate most of its plants in the district on an island just below Pittsburg, very well adapted to the purpose, and to add considerably to the capacity as the works are removed, besides building a line of very fine blast furnaces. But the most significant growth and tendancy in the district is in the direction of more finished material. Four new steel casting plants have been built or projected within the year, in addition to one which was projected last year and which is now in operation. The largest car works, and the only one making steel cars on a large scale, has been completed and put in operation. When running full it will consume more than a thousand tons of steel plates a day, besides a very large quantity of other material. There has been an unusual exploitation of steam coal and coking coal land to the south of Pittsburg, and further progress has been made toward the slack-watering of the Ohio river by which coal and manufactured products may be carried with more regularity to lower river points or to tidewater.

It had been expected that by the end of the year 1899 enough would have been learned of the policy and practical operation of the recently formed iron and steel consolidations to enable a forecast to be made with some assurance of certainty as to their future. The year has brought out less than was expected, because it has been such a very good one. The ability of the consolidations to manufacture more cheaply can scarcely be held to have been tested in a year which brought into operation rolling mills long since regarded as scarcely worth wrecking. Nor has it shown much as to the saving to be effected in reduced cost of operating selling departments, when all goods have sold themselves and buyers have been more interested in how soon the material could be delivered than in how much it would cost. The full force of this point may be appreciated when it is said that when in an important line traveling salesmen were put out on the road again late in the year in order to renew acquaintanceship and discuss business for next year, it was found that their appearance tended to frighten away orders rather than

secure them, and they had to be recalled. Two things, however, have developed pretty clearly. The iron and steel consolidations in general are showing no disposition to run the business with a view to possible effects on stock market values. They have generally shown little desire to pay even dividends which have clearly been earned. In connection with this it has been made clear that their policy will be to concentrate and improve their works, and to add sources of raw material, where these have been lacking. Thus they are paving the way to secure for the future a continuance of the commanding position which they hold today. The year has developed considerable hostility toward the "trusts", mainly on the part of that section of the public which is entirely unfamiliar with the iron and steel trade, price advances being charged to the operations of trusts when in fact there was no connection whatever. Many lines in iron and steel where there is no semblance of a trust have advanced in greater percentage than other lines in which there are trusts.

While it is a fact that producers received the very high prices on but a very small part of their total product for the year, it must be pointed out that the very heavy tonnage would have shown an excellent profit if there had been no advance in prices above those with which the year opened. The benefit of the high prices has been participated in to a varied extent by the different producers, according as their selling departments were far sighted or otherwise, but in all cases the year has been a most satisfactory one.

Wages have advanced steadily through the year, and at the present time are on a higher level than they have been for many years. In the tin plate industry they are higher than they ever were before. At times there has been an actual dearth of both skilled and common labor, and much new erection has been interfered with by the scarcity of labor. Part of the advances made in wages has been due to the formation of the consolidations; in a number of such lines advances being made which would not have been made, or would have been made only at a later date, had the consolidations not been formed. The consolidations have had another effect on labor, in that their policy of getting the maximum efficiency from each plant operated has tended toward steadier employment and higher wages at some plants, to the total shut-down of other plants.

Pig Iron.

The year was a particularly good one for the blast furnaces, and in view of the fact that at its close they had sold their product for this year to a greater extent than has been the case in any other line, it may well be said that they have had a better year than any other branch of the iron industry. This fact is particularly interesting because it was only as far back as the early and middle parts of 1898 that the independent producers of Bessemer pig iron felt pretty well assured that their days were numbered and that they would be entirely replaced by furnaces erected by steel works owners. The very great increase in demand, and the slowness with which modern blast furnaces are built, has put the independent furnaces in a very strong position, from which they can be shaken only gradually. An important matter to the independent Bessemer furnaces is the great rush which has developed toward steel castings in place of iron. The new steel casting plants which are being erected will use a considerable quantity of Bessemer iron.

The course of prices for pig iron has been steadier than that in any other line. Furnaces sold so heavily toward the end of 1898 and the early part of 1899 that they could not come near making the deliveries they had promised. The question of buying spot iron therefore did not come up to any very great extent, and steel works busied themselves more in trying to get the iron they had contracted for than in buying more iron. At the height of the scarcity every steel works had a representative at the furnaces who sought by every means to divert pig iron to his own works, and unusual means were employed to find out where the daily product of the furnace was going.

At the close of the year the outlook in pig iron was stronger than in any other line, and prices were in general at the highest level of the year. This is particularly the case with Bessemer iron.

Steel.

In no other line was the scarcity so pronounced, in the third quarter, as in steel. Prices for spot delivery were several dollars a ton above those which could be made for later delivery, and the character of the demand for various forms did not fit productive capacity—this to such an extent that slabs commanded for a considerable period a higher price than 4x4 billets. Sheet bars, on the other hand, were for some time lower in price than billets. These matters had righted themselves by the end of the year, and the premium for spot delivery had entirely disappeared, while the price even for future delivery had gone off considerably. The production of Bessemer steel for the year was probably slightly higher than for 1898. The difference would have been marked had it not been that steel works were unable to reach their capacity owing to the scarcity of pig iron. The production of basic open-hearth steel increased very materially over 1898 and the new furnaces being built and those projected will make the production of 1900 much larger even than that of 1899, if the demand is sufficient to keep the increased capacity going.

The steel billet market is of much less importance than it was, since the tonnage of billets passing in the open market is a constantly decreasing quantity owing to the concentration of interests. The amount is even now scarcely sufficient to swing the remainder, so that the price of billets in the open market is not the guide that it formerly was in considering the prices of products made from billets. The wire rod market is also of very minor importance under present conditions.

Bars.

The year has been a very good one for the makers of both steel and iron bars. Prices have been good, and the scarcity in the third quarter was such that mills received very high premiums for quick shipments, while prices for delivery from stock were phenomenally high. Toward the close of the year the pressure eased up and prices declined materially, but the market closed very firm.

Structural Material.

The market has been entirely in the hands of the beam pool throughout the year. Price advances were made from time to time but they were less in amount than occurred in several lines where free competition prevailed. The production has been very heavy. A much larger percentage of the output than usual has gone into buildings for industrial purposes, and the outlook in this direction is especially good. It has been predicted that the high prices would seriously affect the erection of office and similar buildings, but this influence has probably been overrated. A great deal of new work in this direction is contemplated, and much of it, it now appears, will be done.

Pipes and Tubes.

The course of prices for merchant pipe, casing, boiler tubes, etc., has been steadily upward, but practically all the advances were made earlier in the year, before the consolidation of producers into the National Tube Co. was completed. In the summer the mills were very far behind in deliveries, but later on got well caught up. The demand in the last two months of the year, which are usually dull, was quite good.

Plates.

The plate market was the most erratic of all in 1899. The demand until near the close of the year was very heavy indeed, mills being far behind in deliveries, notwithstanding the fact that a number of mills long idle started producing. Very heavy premiums were paid at the height of the scarcity for quick mill shipments or deliveries from stock. Beyond the general demand for iron and steel, the plate market was affected by the growing consumption of plates in the manufacture of steel cars. Toward the close of the year prices broke badly, especially for prompt delivery. The cause was attributed largely to the entrance of so many small mills into the field, and this view was supported by the fact that narrow plates were relatively much lower than very wide plates. The break did not affect boiler steel so much as tank plate.

Sheets.

The sheet iron trade did not participate to as great an extent as many other lines in the prosperity of the year, the cause

for which was not easy to discover. Efforts were made during the year to form a consolidation, and when this was given up on the expiration of options Nov. 1, a decided demoralization ensued, caused largely by the efforts of mills to market product in order to take from steel mills the sheet bars which had been purchased earlier in the year at lower rates. The trade in galvanized iron was affected o about the same extent by this cause, and was unsettled further by the erratic course of spelter, which puzzled the trade a great deal.

Tin Plate.

The tin plate industry had a full year under consolidation regime, and saw a number of changes. The product moved direct from the mills to the large consumers and dealers. Cost of production was increased to a greater extent than in any other line of iron and steel manufacture, because an addition to the advance in steel the price of pig tin reached a higher level than in many years, and wage advances were greater in the tin plate industry than in most other lines. From the beginning to the close of the year tin plate advanced 65 per cent, while steel more than doubled in price, wages advanced from 15 to 25 per cent, and tin almost doubled. In the case of tin, however, there was a sharp recession toward the close of the year, still leaving the price about double the lowest on record. During the summer the mills were run to their utmost capacity and were yet at times several weeks behind in deliveries. As the season of heavy consumption was passed the mills readily caught up, especially since under central management and through the increase in the Amalgamated Association limit of output the product per mill was much increased. The production for the year can only be roughly estimated, but it will certainly prove to have been much greater than in any former year. The largest tin plate plant in the world, the 30-mill plant at New Castle, was put in operation for the first time early in the year. Several plants have been dismantled and their machinery removed and set up at other works, while a few wholly new mills have been built. It is expected that in a few years, instead of the 35 or 40 plants in existence at the beginning of this year, there will be half a dozen or less very large plants, located at the best points for manufacturing and distribution.

British Specifications for Hard Iron Castings.

A British technical paper gives the following abstract of specifications of several prominent makers of agricultural implements in Great Britain for special hard iron castings, such as those designed for air and ammonia compressors, high-pressure engine cylinders, valves, etc :

Silicon must be between 1.20 and 1.60 per cent. (Below 1.20 per cent the metal will be too hard to machine; above 1.60 per cent it is liable to be porous unless much scrap be used.) Sulphur not over 0 095 per cent. Any casting showing 0.115 per cent or more of sulphur will be the cause for rejection of the entire mix. (Above 0.115 per cent produces high shrinkage, shortness and "brittle hard" iron.) Phosphorus below 0.70 per cent, unless specified for special thin castings. (High phosphorus give brittle castings under impact.) Manganese not above 0.70 per cent, except in special chilled work.

Transverse breaking strain, with load applied at the center and supports 12 inches apart, on a square test bar 1 inch square and 13⅓ inches long, and must stand a stress of not less than 2,400 lbs. All bars to be micrometered and figured to an exact square inch. Deflection not less than 0 08 inch. Shrinkage, measured on a 12⅓-inch bar cast in a yoke, giving chilled ends must not exceed 0.161 inch after deducting one-tenth, so as to compute the shrinkage in 12 inches. Chill, measured on the end of a test bar cast in a yoke, not more than 0.25 inch, except in chilled work, where certain depth is required. Tensile strength of an extra test bar cast in sand, without the yoke, not less than 22,000 lbs.

The castings must be free from blow holes, slag, dirt, shot, cinder, kish, and cold shuts. A clean, close-grained and strong iron is required for this class of work. The mixture for this iron may be made from charcoal iron, low silicon foundry, home scrap and steel scrap not to exceed 20 per cent, or wrought scrap not to exceed 10 per cent. Enough scrap should be used so as to keep the graphitic carbon down low enough to produce a close-grained iron.

Extra strength and greater chill may be obtained by adding from 1 to 10 lbs. of 80 per cent ferro-manganese to every 1,000 lbs. of the charge, but should not be added unless specified.

ROUND RECORDING PRESSURE GAUGE.

The illustrations Figs. 1 and 2 show exterior and interior views of a new round recording pressure gauge that is being placed on the market by the Bristol Co., of Waterbury, Conn. This new form has been designed to meet a demand for a recording gauge at a lower price than their standard gauges which in the ten years they have been in use have become known for accuracy and durability. A special feature of the round form is that the dial is located slightly eccentrically to the main body of the case, thus allowing sufficient space on

FIG. 1.

lower side of the dial for the pen arm to pass out between the dial and the case.

Fig. 1 shows the exterior of the gauge complete and ready for application. Fig. 2 shows the interior construction of the instrument and the extreme simplicity upon which its accur-

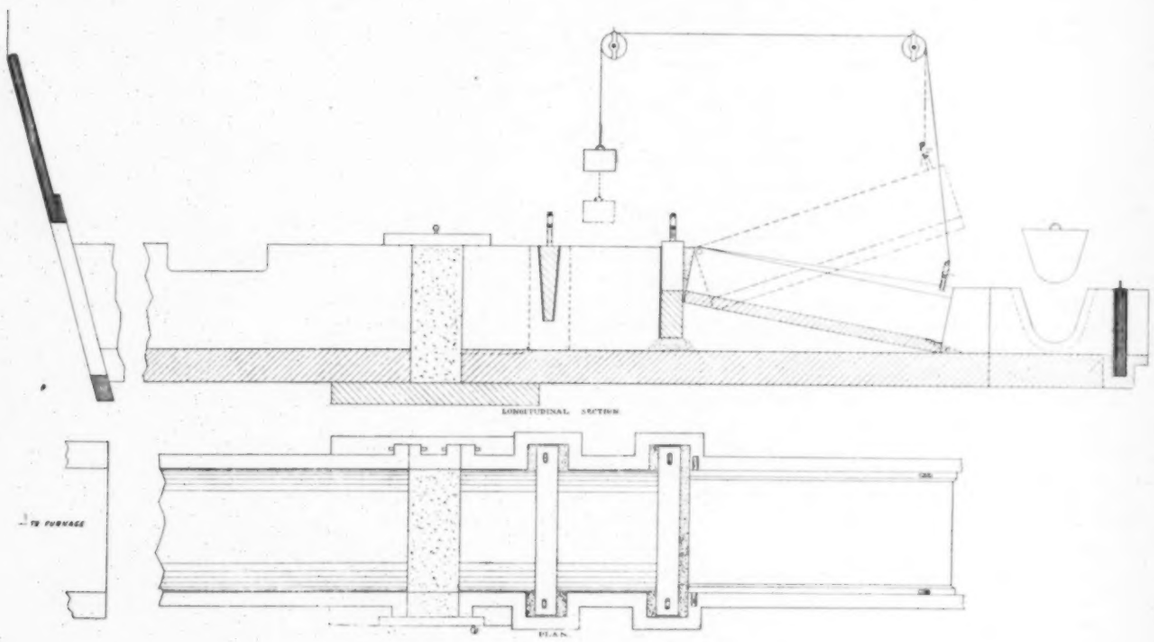
FIG. 2.

acy and durability depend to a large degree. The pen arm is directly attached to the free end of a tube of flattened cross section, which is bent into a helical form. The tendency of pressure applied is to straighten or uncoil the helical tube, which causes the pen arm to move over the range of the chart without the necessity of any intervening multiplying devices. With a view to widening the use of recording pressure gauges and other recording instruments, the Bristol Co. is filling orders for these instruments with the privilege of return after 30 days' trial.

THE BACHMAN METAL SKIMMING TROUGH.

The chief difficulty in connection with the metal skimming troughs heretofore used has been that of separating the slag from the iron which is held back by the dam at the end of the cast, resulting in one or two beds of iron often being covered with slag, and the excessive labor required to clean the trough in case of a heavy runner. In addition are the troubles which arise if the iron runs from the furnace slow enough to chill before it flows over the dam, and the necessity of draining the iron retained in the trough into separate beds lower than the general level and always on the same side of the cast house, which necessitates unnecessary shifting of cars and the rapid cooling and removal of this iron. Where the sand is none too good and casts are made in rapid succession, there is always danger of boils in these beds, a danger which almost overcomes all the advantages gained by freedom from them at the main skimmer when a sand runner is used.

F. E. Bachman, of Buffalo, N. Y., has invented and patented an improved metal skimmer trough, for the use of which he is granting licenses. As the cuts show, it is so constructed that the iron held back by the dam is drained into the main runner by an opening through or under the dam, and goes into the beds or ladles with the body of the cast.

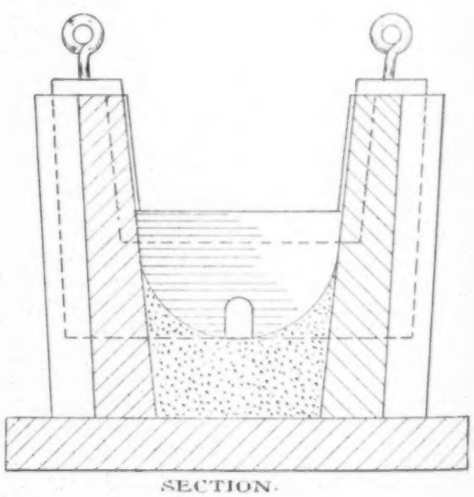


BACHMAN METAL SKIMMING DEVICE.

The metal trough can be continued to the pig beds or ladles if desired, using gates and shutters as shown. The slag being drained from the side of the trough at a point above the skimmer, which is usually of brick, is not cut by the slag passing under it; and the slag not being dammed back the trough drains so perfectly that with a little experience the workmen are enabled to dispense almost entirely with cleaning and grouting the trough above the drain, provided a fairly good clay or loam is used for this purpose. At the Buffalo Furnace Co., where this trough has been in use for over a year, it is the practice to clean under the dam and skimmer each cast, the remainder of the trough being cleaned once or twice a week.

It is hardly necessary to point out the ease of removing a heavy runner. The dame being removed gives access at the lower end. The skimmer and drain opening cause it to break into three pieces. If the separating piece is left out of the side opposite the slag drain and the troughs held together by a long bolt instead, a perfect chance is given to get bars under the runner from both sides at this point.

The operation of the trough is simple. The skimmer is placed in position, the space around it filled with clay or loam. The dam is placed as near the skimmer as possible, so that there are one to two inches space between it and the lower side of the recess in which it is set. A little stiff clay being packed in the joint, the remainder of the packing space is filled with sand. By so doing the dam can be lifted out, if on account of a slow run or a heavy runner, it is desirable to remove it to clean the trough. The trough is then grouted and the bottom opening through or under the dam closed with sand. The supplementary trough is dropped into position, the joint between it and the dam filled with clay or loam, and the lower end covered with a little stiff clay, as shown, and grouted. The drain opening is closed with a shutter and lined up with sand. Running and skimming the iron is automatic. At the end of the cast while the tapping hole is being plugged one man raises the supplementary trough and pricks open the opening through the bottom of the dam to allow the iron held in the trough to drain through. He then raises the gate at the slag drain. As soon as slag appears under the skimmer, he cuts away the sand as low as the bottom of the skimmer, allowing the slag to drain away. When the slag shows through the opening under the dam he cuts away the remainder of the sand down to the plate under the troughs, and the remainder of the slag drains out. If the slag is thick and sticky he rakes the bottom of the trough slightly to clean it. The small amount of slag which passes under the skimmer drains back. The trough is then cleaned



SECTION.

from the slag opening to the dam and the opening under the dam cleaned. It is then grouted, the opening under the dam filled with sand, the supplementary trough lowered, and is

ready for another cast, which can be run in an hour or less if desired. A sand fall can be used instead of the supplementary trough, which fall is shoveled out before the trough is drained. But as the original experimental supplementary trough has been in use at the Buffalo Furnace for over a year, there appears no danger of its cutting away if properly grouted and clayed at the lower end.

The saving due to the use of the trough at the Buffalo Furnace, where sand is expensive, was as follows for one year, based on present rates paid for labor and material:

1,300 tons sand, at $1.30 in cast house	$1,690
730 days' helper, $2.10 per day	1,533
60 tons clay at $1.90 per ton	114
	$3,337

To this should be added the cost of boils which, allowing one per year, loss of a cast, and a day's stop to clean up, would add on a 250-ton furnace as much more at the present value and cost of iron.

THE ERWIN RAM AS A MINING PUMP.

A desideratum in mining operations is a pump that can be used to advantage and with good economy for the lifting of water from mines or pits not exceeding 75 or 80 feet in depth, one that can be used under all the varying conditions, and which does not require appendages in the way of extra pipes, pulleys and lifts. As filling this description, James B. Clow & Sons, of Chicago, offer the Erwin steam ram to those engaged in mining operations. Already it is being used extensively by railroads and agriculturists for pumping from all kinds of wells, from cisterns, lakes and streams, with results that are spoken of as exceptional, not only on account of the liberal, constant water supply they give, but because the system is in itself practical, reliable and inexpensive, and because the good results obtained are regardless of natural conditions, provided there is a vein within tapping distance. A special feature of this ram, especially in its adaptation to mines, is that the whole apparatus below the surface occupies no more room than a good sized steam pump. The ram, which is small, is suspended directly from its steam and water pipes, requiring no extra rods for support.

The elevating powers of one ram are limited to about 75 feet, although it is being used now to elevate water to 85 feet. When the distance to be overcome is greater than this, however, more rams may be thrown in. For example, in a shaft 150 feet deep, two of the rams would be used, one being connected half way down the shaft, the same steam pipe sufficing for both. The steam pipe, in the latter case would be covered, to prevent condensation.

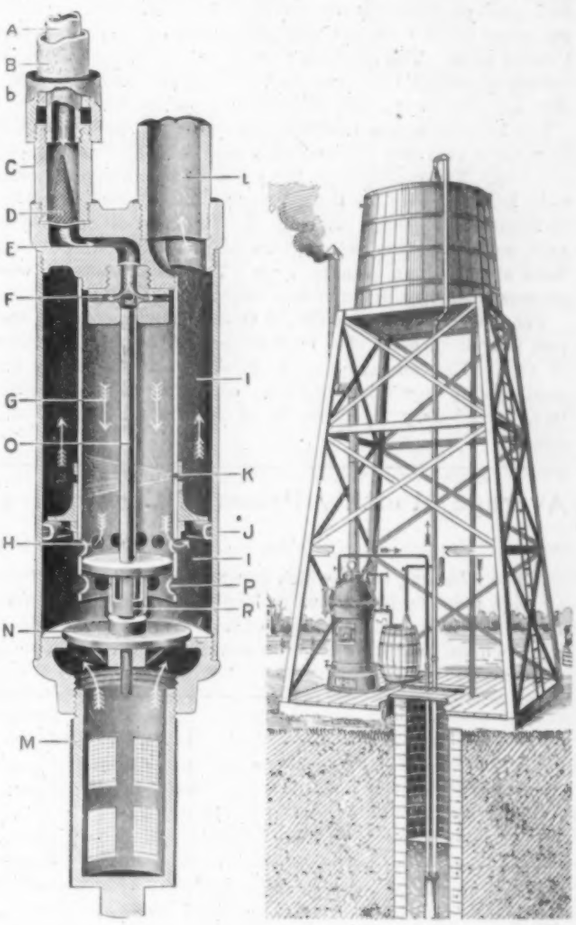
The Erwin pumping system consists of a Triumph steam boiler and an Erwin steam ram, both of which are manufactured by James B. Clow & Sons. The ram is a comparatively new device and in some respects unique. On account of its compactness and small diameter, it can be suspended by its steam and water pipes below the surface of the water in a tubular well, or any kind of a well. It can be placed in a cistern, or can be so placed as to pump directly from a lake or stream. It requires no oil, no packing, no attention. The amount of friction is slight, and water is raised with greater economy than by using a duplex steam pump of equal capacity. The ram is made of brass, with steam metal bearings. The strainer is of malleable iron with brass screen.

When the ram is at work, water is elevated by the alternate action of steam and atmospheric pressure. The steam having first driven the water from the ram is instantaneously condensed and a vacuum is formed. A volume of water is then driven into the ram, by atmospheric pressure, and not only fills the vacuum chamber but a large proportion passes on through the ram and into its discharge pipe. The steam and air thus co-act to make the discharge of water continuous. To the facts that a good portion of the work is done by the atmosphere and that friction is almost entirely eliminated, the high efficiency of the ram is largely due.

The ram is placed beneath the surface of the water in the well or other source of supply, and, before starting, water flows into it by gravity. When steam is turned on it passes through the steam pipe A, nipple C, conical screen D, the main steam port E, and radial steam ports F into the cylinder G. The water is then forced downward through the openings H into the surrounding discharge chamber I, where it passes through the annular check valve J and out of the discharge pipe L. When the steam reaches the lower end of the cylinder G, it is exhausted through the large openings H much faster than it is admitted through the steam ports F, is condensed in the surrounding discharge chamber I, and a partial vacuum is formed within the cylinder G. The vacuum is made more complete by a spray of water which then rushes inward from the discharge chamber I through the small opening K.

The instant a vacuum is created and condensation occurs the pressure of the atmosphere on the water outside of the ram forces water upward through the bottom strainer M. The main check valve N then rises and the valve rod O, which is rigidly attached to it, shuts off the steam at the upper end of the cylinder. A volume of water under atmospheric pressure is at the same time forced upward through the discharge chamber and out through the discharge pipe. A portion of this water, however, passes through the openings P, forces up the float R, which moves freely on the valve rod O, and refills the cylinder.

The water under atmospheric pressure having then lost in



momentum, the steam acting downward on the valve rod closes the main check valve, and through pressure exerted on the float, again forces water out of the cylinder and through the discharge chamber and discharge pipe. A covering pipe B surrounds the steam pipe for the distance it is submerged beneath water, to prevent condensation and is received into the coupling b.

By connecting the discharge pipes of two single rams, a double ram, of twice the capacity of a single one, is formed. Each of the rams forming the combination has a separate steam pipe, but the discharge pipe is common to both. While they work in unison in forcing water, either one can be shut down, by turning off its steam valve, without stopping the other. In addition to doubling the capacity, therefore, the double ram renders a constant supply certain.

The practical applications for such a device are almost un-

limited wherever the elevation of water is desired. It is now used not only for railroad work, and irrigation purposes, but for steam boats, hotels, private residences, etc. The illustration herewith shows one of the pumping systems as it is frequently set up for railway work and for irrigation and farm purposes. Thus used, the boiler may be set within the base of the tower supporting the tank. After being pumped into the tank, the water may be drawn directly from it, or distributed from it, through pipes, to desirable points for use.

BUSY NORTHERN OHIO INDUSTRIES.

Russell & Co., of Massillon, O., one of the largest manufacturers of engines, threshers, etc., in the country, report that their output for 1899 was double that of the preceding year. The capacity of the plant for this year will be about 25 per cent greater than ever before. More than 1,000 people are employed and the machinery is shipped all over the United States, Cuba, Sandwich Islands and to many foreign ports. The business was established in 1842 and the present company was incorporated in 1878.

The Columbia Iron & Wire Works Co., of Canton, O., reports an increase of output of 25 per cent over that of 1898, with good prospects for the coming year. The company was organized seven years ago and does business mostly in the Central West. The product turned out is comprised in a variety of architectural iron work, as well as ornamental iron, wire and brass work adapted for banks, offices, etc.

The Diebold Safe & Lock Co., of Canton, O., had a decided increase in 1899 over the preceding year, with all departments filled up. The vaults, safes and jail work of the company are to be found all over the United States and Mexico. One of its latest achievements has been the shipment of one of the most modern burglar proof vaults to the American-Colonial Bank at San Juan, Puerto Rico. The establishment was organized 30 years ago and now employs about 350 men.

The Universal Machine Co., of Canton, O., reports for the past year an increase of at least 50 per cent over the business of 1898. The company manufactures special machinery for steel roofing concerns and also conductor pipe and eave trough machinery, the goods being sold in all parts of the country.

A. Heimann & Bro., of Massillon, O., manufacturers of stone quarry rolls, rolling mill castings, and mining machinery, closed last years' business with a showing of one-third increase over 1898. The firm was established six years ago and sells its product throughout the Central and far West.

The Bucher & Gibbs Plow Works, of Canton, O., have closed the old year's business with a very decided gain over 1898. The works were established in 1864 on a small scale and now employ 235 men besides 20 traveling salesmen. The product is shipped all over the United States, and an extensive foreign trade is also supplied. The annual capacity of the works is 20,000 plows, 20,000 cultivators, and 15,000 harrows of the spike, spring and disc varieties.

The Roderick Lean Mfg. Co., of Mansfield, O., manufacturer of steel harrows of the spike tooth variety, reports an increase of 25 per cent for last year in output as compared with 1898. The business was established in 1876 and the present company incorporated in 1893. About 75 men are employed and the markets for the product extend throughout the United States, Mexico and foreign countries.

The Eclipse Stove Co., of Mansfield, O., manufacturer of heaters, cooking stoves, cast and steel ranges, reports an increase of one-third in the business of last year as compared with 1898. The company was organized in 1883, and disposes of its product mostly throughout the United States. At present about 250 men are employed.

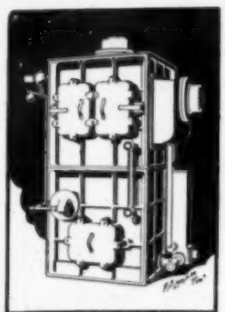
THE Ruhr coal district, close to the Rhine, near Düsseldorf, which covers but a small area, has the densest traffic, probably on the Continent of Europe, with the possible exception of Belgium. Nov. 10 last, within 24 hours, 21,741 loaded cars were dispatched there, 16,054 being loaded with coal or coke. The capacity of these cars is generally 33,000 lbs. The first time that as many as 15,000 car-loads of coal were shipped there was Nov. 29, 1897. A local newspaper estimates that the shipments Nov. 10 would have made a train 108 miles long.

AN error in our last issue located the machine shops of H. Bickford, manufacturer of boring and turning mills at Lakeport, N. Y. It should have read Lakeport, N. H.

Average Monthly Prices of Certain Iron and Steel Products in the United States in 1898 and 1899.

The following table, which appears in the *Bulletin* of the American Iron and Steel Association for Jan. 1, 1900, gives the average monthly quotations of leading articles of iron and steel in Philadelphia, Pittsburg and Chicago markets in 1898 and 1899. The averages are computed from market quotations as published from week to week. The prices are for gross tons of 2,240 pounds, except for bar iron and cut and wire nails, which are quoted by the hundred pounds and the keg of 100 pounds, respectively:

MONTHS.	Old Iron T Rails, at Philadelphia.	No. 1 Foundry Pig Iron, at Philadelphia.	Gray Forge Pig Iron, at Philadelphia.	Gray Forge Pig Iron, Lake ore, at Pittsburg.	Bessemer Pig Iron, at Pittsburg.	Steel Rails, at Mills, in Pennsylvania.	Steel Billets, at Mills, at Pittsburg.	Best Refined Bar Iron, from Store, at Philadelphia. Base.	Best Refined Bar Iron, at Pittsburg. Base.	Cut Nails, per Keg, from Store, at Philadelphia. Base.	Wire Nails, per Keg, at Chicago, Single Car-load Lots. Base.
January, 1898	$12 50	$12 00	$10 37	$ 9 00	$10 00	$18 00	$15 00	$1 40	$1 15	$1 35	$1 55
February	12 50	11 87	10 25	8 97	10 06	18 00	15 12	1 35	1 15	1 35	1 57
March	12 50	11 75	10 25	9 06	10 37	18 00	15 37	1 35	1 05	1 30	1 55
April	12 44	11 75	10 25	9 22	10 35	18 00	15 30	1 25	1 05	1 30	1 47
May	12 00	11 65	10 25	9 12	10 41	18 00	14 94	1 25	1 05	1 30	1 45
June	12 00	11 44	10 25	9 14	10 42	17 50	14 75	1 25	1 05	1 30	1 43
July	12 00	11 25	10 25	9 11	10 31	17 00	14 75	1 25	1 05	1 30	1 36
August	12 05	11 30	10 25	9 19	10 35	17 50	15 02	1 25	1 05	1 30	1 36
September	12 50	11 50	10 19	9 36	10 45	17 50	16 00	1 25	1 08	1 30	1 43
October	12 50	11 70	10 00	9 33	10 40	17 50	15 80	1 25	1 10	1 30	1 46
November	12 70	11 75	10 00	9 24	10 22	17 00	15 12	1 25	1 04	1 30	1 39
December	12 94	11 97	10 41	9 46	10 64	17 50	15 90	1 25	1 00	1 30	1 37
January, 1899	13 30	12 12	10 75	9 89	11 00	18 50	17 06	1 30	1 12	1 40	1 59
February	14 16	13 25	11 69	10 87	11 69	20 25	18 87	1 45	1 22	1 65	1 73
March	16 87	16 00	14 37	13 29	14 77	24 80	24 25	1 70	1 38	1 75	2 09
April	17 87	16 50	15 00	14 50	15 06	25 75	25 25	1 75	1 65	1 95	2 25
May	18 00	16 60	15 30	15 07	16 32	25 20	27 56	1 90	1 75	1 95	2 35
June	18 75	18 62	16 50	15 94	18 70	27 25	31 87	2 00	1 88	2 20	2 57
July	20 00	20 37	17 81	17 50	20 45	28 25	33 80	2 30	2 00	2 30	2 70
August	21 30	21 70	18 10	18 37	22 37	31 00	36 37	2 40	2 28	2 35	2 80
September	23 12	23 50	19 50	20 90	23 85	32 50	41 50	2 50	2 50	2 60	3 06
October	26 20	23 70	19 65	21 19	24 50	34 00	41 50	2 50	2 60	2 75	3 17
November	27 50	25 00	20 19	21 56	24 69	35 00	39 00	2 50	2 56	2 80	3 28
December	27 25	25 00	20 31	21 52	25 00	35 00	36 37	2 50	2 50	2 80	3 28



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COCHRANE FEED-WATER HEATERS.

Additional Economy

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It is within the province of a properly designed feed-water heater to effect economies or increases of power so considerable that the cost of one of these appliances represents only a small proportion of the savings made during a single year's run. The saving or the earning capacity is something positive and tangible—something which can be computed or measured. No matter how economical the engines are in developing power—no matter that the boilers are of the most efficient type for transmitting heat from the fuel to the water—a feed-water heater will improve the plant and still further decrease the coal consumption.

Four tons of coal can frequently be made to do the work of five tons, without a single change in the engines or boilers, or in the way of running them. Nine tons of coal can be made to accomplish nearly as much as ten tons, even in a plant where everything is run condensing. The factors in each case are the same; i. e.,

Exhaust Steam

COCHRANE FEED-WATER HEATERS

and Brains (the latter being only the commonsense adaptation of the means at hand to meet the requirements.)

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INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

It is reported that Armstrong Bros., of Springfield, O., will locate their boiler and engine works at Upper Sandusky, O., and that work will begin at once.

The Covington, (Ky.) Foundry Co., with $10,000 capital stock, has filed articles of incorporation. Benjamin Sebastian is the chief stockholder.

Fires and Accidents:—

The Jones scale works at Binghamton, N. Y., were damaged by fire to the extent of $50,000 on Dec. 26.

At Alton, Ill., Beall Bros.' mining implement works burned. Loss, $50,000, with insurance of $26,000.

At Augusta, Ga., the Perkins Mfg. Co.'s Georgia Iron Works and saw mill burned, with $175,000 loss; insurance $95,000.

New Construction:—

The United States Steel Lock Co., St. Louis, will build a foundry addition, 30x60 feet.

The Ludlow-Saylor Wire Co., St. Louis, has bought a site 168x342 feet, and will erect a wire mill.

A steel casting plant is to be built at Ensley, Ala., it is reported, as an adjunct of the Tennessee Coal, Iron & Railroad Co.'s large interests.

At Chester, Pa., the Solid Steel Co., which purchased some time ago the plant of the Eureka Steel Works, has let a contract for a foundry addition 60x60 feet.

The Chester Steel Casting Co., Chester, Pa., which has made important additions in the past two years, will add another building, 60x84 feet.

Estimates are being received at Chicago for a new machine shop, 204x60 feet, for Fraser & Chalmers.

The Chicago Malleable Casting Co. is completing its new foundry at West Pullman, Ill., and other buildings are being pushed. They cover 500x380 feet.

The Globe Range Co., Kokomo, Ind., is to build a foundry 80x60 feet.

The Buckeye Engine Co., Salem, O., is preparing plans for extensive additions.

The Hastings Engine & Iron Works, Hastings, Mich., is erecting a foundry building 50x100 feet.

Plans have been completed for an addition 50x64 feet, to the machine shops of the Frankford Steel & Forging Co., Ellwood City, Pa.

The Pittsburg District:—

The contract for the large extensions to the plant of the Carbon Steel Co., was awarded to Wm. B. Scaife & Sons, Pittsburg. The specifications consist of a great amount of plate girder work and steel frame construction.

David Lamond has contracted with D. S. Cook & Son to erect one C. H. Foote fire brick stove, two pass, at their Princess furnace, Glen Wilton, Va., and has also contracted with the Columbus Iron & Steel Co., to equip its two new furnaces, being built at Columbus, O., with six C. H. Foote stoves, two pass, 18x75 feet, three for each furnace.

The Park Steel Co. has closed its option for 50 acres of the Samson Stilley heirs' farm, at West Elizabeth, at a price of $1,000 per acre. At the same time the firm has secured options on 45 acres of the Madison Parkinson farm, at $600 per acre; 100 acres of the Benjamin Gilmore heirs' farm, at $1,000 an acre; and several smaller pieces of adjoining territory. The total amount of the purchases will equal almost $200,000. It is the intention of the company to move its works to West Elizabeth within the next two years. The site now occupied by the Black Diamond Steel Works is leased ground and the lease expires in 1901.

In the United States Circuit Court at Pittsburg the case of the Clinton Wire Cloth Co. against the Hendrick Mfg. Co., involving alleged infringement of a spiral spring patent, was settled. The plaintiff is to receive $864.93.

The Oliver Iron & Steel Co., Pittsburg, has taken out a permit to erect a $15,000 building on the Monongahela river front, between South Tenth and South Twelfth sts., Pittsburg. The building will be used as a machine shop.

General Industrial Notes:—

The Warwick Iron & Steel Co., Pottstown, Pa., awarded the contract for foundations of a large draft stack, engine house and engine, piers and abutments for a steel shipping pier, 135 feet in length, for its furnace.

At the Bement, Miles & Co. plant at Philadelphia, of the Niles-Pond-Bement Co., a large amount of work is in hand and more men are employed than ever in the history of the works. A boring mill being built for the Austrian government will turn 25 feet in diameter. A 125-foot lathe and a large horizontal floor boring machine for the Westinghouse Machine Co. are also well under way. Recent shipments include a 46-inch wheel lathe for the Baltimore & Ohio Railroad.

Wm. Sellers & Co., Inc, Philadelphia, have taken an order recently covering 10 large cranes for the Cambria Steel Co.

Hooven, Owen & Rentschler proprietors of the Hamilton, O., Corliss Engine Works, report a full 25 per cent increase in 1899 over their already large business. They are now working 24 hours per day with a full force of 350 men. Foreign orders for the year have amounted to about 10 per cent of the entire output.

The stockholders of the Lackawanna Iron & Steel Co., in a special session at Scranton, Pa., Dec. 29, voted in favor of increasing the capital stock from $3,750,000 to $25,000,000. No official statement as to the purpose of the increase was given out further than it was to put the company in a position to take advantage of any opportunity that might present itself for bettering its condition. It is understood to be a move toward pushing the big steel works project at Stony Point, below Buffalo.

The Newton Machine Tool Works, of Philadelphia, report that they are receiving more orders for the cold saw cutting off machines for steel foundries than in any other line of their work. Among the orders recently received are two large

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saws for the Penn Steel Casting Co., and saws for the American Steel Casting Co., and for the Logan Mfg. Co. With the closing of 1899 the company had shipped about 75 per cent more machines than during any previous year.

It is reported that the necessary money has been subscribed for a steel foundry at Pottstown, Pa., and that 100 men will be employed.

Harry A. Parr was appointed receiver for the Columbian Iron Works and Dry Dock Co., of Baltimore. The obligations of the company amount to nearly $400,000. Philadelphia creditors have petitioned for the appointment of a co-receiver.

Stack No. 5 of the Crane Iron Co. furnaces was put in blast Dec. 21.

The Sharon Steel Co. has elected John Stevenson, Jr., of New Castle, a director. It is reported that Mr. Stevenson recently subscribed for $800,000 of the company's stock.

The Tidewater Steel Co. has started the engines in the reconstructed Wellman plate mill at Chester, Pa., and the 112-inch mill will begin shortly to roll plates. Two new 50-ton open-hearth furnaces are ready to start.

Beall Bros., whose foundry at Alton, Ill., was burned two weeks ago, have received offers from Granite City and East St. Louis to locate the new plant. There have been some negotiations for the Richard Garstang foundry at Alton.

The Star Drilling Machine Co., of Akron, O., has increased its capital stock from $100,000 to $200,000, for the completion and equipment of new buildings. Geo. J. Hoffman, of Cleveland, has been elected president.

President Guthrie, of the American Steel Hoop Co., says that the October and November earnings were $1,250,000. The shut-down planned for the last week of December for inventory was postponed on account of the volume of early delivery business on hand.

The Grand Rapids, (Mich.), Malleable Iron Co. has increased its capital stock from $125,000 to $200,000.

The Vulcan Foundry & Machine Co., New Castle, Pa., has just finished 60 ingot cars for the Shenango plant of the National Steel Co., also 30 for the Aetna Standard Iron & Steel Co., Bridgeport, O., and has contracted for 30 for the Schoenberger plant of the American Steel & Wire Co. The Vulcan company is well equipped to handle mill castings and machinery work of all kinds.

The American Iron & Steel Co., which has just declared its first dividend of 1⅔ per cent on the preferred stock and 50 cents a share on the common stock, is capitalized at $20,000,000, including $3,000,000 of 5 per cent preferred stock, full paid, and $17,000,000 of common stock, $5 paid. Its plants are at Lebanon, East Lebanon, and Reading, Pa.

The Pope Mfg. Co., of Hartford, Conn., has sent out its annual calendar pad.

Knoxville, Tenn., citizens promise subscriptions of $50,000 to $100,000 to the stock of a furnace company that will locate there.

DIVIDENDS ON STEEL STOCKS.

Not a little has been written about the possibilities of dividends on the common stocks of the iron and steel consolidations. All these companies are organized under New Jersey law. The decision was given in the litigation over Federal Steel Co. dividends that no dividend can be declared by a corporation of New Jersey upon the common stock, until after one full year's dividends have been paid upon the preferred stock. It also appeared in the same litigation that unless the charter or by-laws of the corporations designated the days upon which dividends should be declared they could only be declared in January of each year. The dates of charters of the various companies are as follows: American Car & Foun-

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MALLEABLE

HIGH GRADE CASTINGS. QUICK DELIVERIES.

BUHL MALLEABLE CO., Detroit, Mich.

dry Co., Feb. 20, 1899; American Steel Hoop Co., April 14, 1899; American Steel & Wire Co., Jan. 13, 1899; American Tin Plate Co., Dec. 15, 1898; Federal Steel Co., Sept. 9, 1898; National Steel Co., Feb. 27, 1899; Pressed Steel Car Co., Jan. 12, 1899; Republic Iron & Steel Co., May 3, 1899. The dividend status of each is thus given in the *Wall Street Journal:*

The Federal Steel Co. has already declared a full year s dividend of 6 per cent upon the preferred stock, and has adopted a by-law fixing the second Tuesday of each month for dividend days. The dividend on the common stock of Federal Steel, declared last summer, of which payment was enjoined, will be declared probably on the second Tuesday of January, and in addition a further dividend of 2½ per cent out of the earnings of 1898 will be declared then or on the second Tuesday of February.

The American Steel & Wire Co. has declared four dividends on the preferred stock of 1¾ per cent each, making a full year's dividend. If the company has provided in its by-laws, or if it is specified in the charter, on what days dividends may be declared upon the common stocks, it may comemnce the payment of such dividends in January.

The Pressed Steel Car Co. has declared four dividends of 1¾ per cent each, making the full year's dividend on the preferred stock, and is therefore in the same position as American Steel & Wire, so far as the payment of dividends on the common stock is concerned.

The American Tin Plate Co. has declared three dividends of 1¾ per cent each upon the preferred stock, and the fourth dividend, making the full amount due on the preferred stock for the first year, is expected to be declared soon after the first of January. The company will then be in the same position as to the payment of dividends on the common stock as the American Steel & Wire Co.

The National Steel Co. has declared three dividends of 1¾ per cent each upon the preferred stock, and the fourth dividend, making the full amount for the year on the preferred stock, is due to be declared Feb. 6, 1900. No dividend can be declared on the common stock until after that time.

The American Car & Foundry Co. has only declared two dividends, the last of which was paid in November, of 1¾

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CATALOGUE SENT ON REQUEST.

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per cent each. The matter of dividends on the common stock cannot, therefore, be considered for nearly six months.

The American Steel Hoop Co. has paid two dividends on the preferred stock of 1¾ per cent each, the last of which was paid in October. The question of dividends upon the common stock cannot be considered for at least six months from that time.

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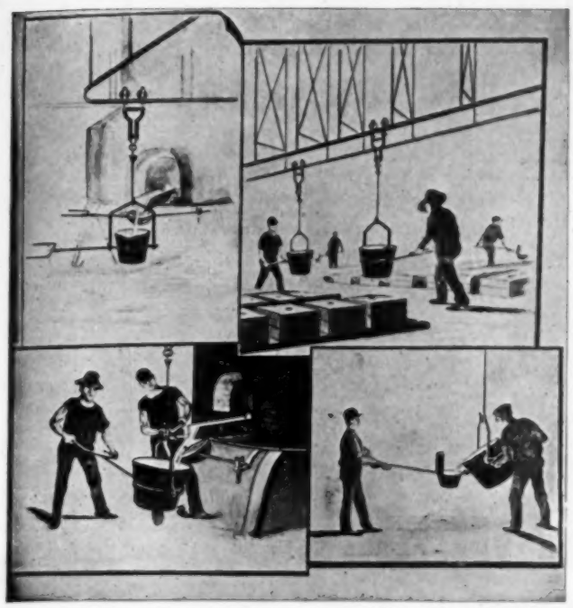

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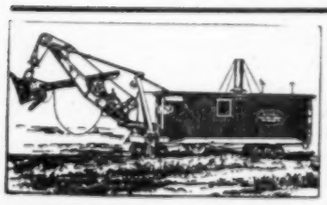

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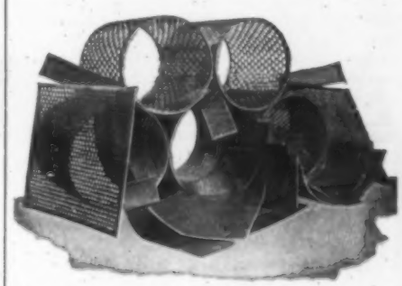

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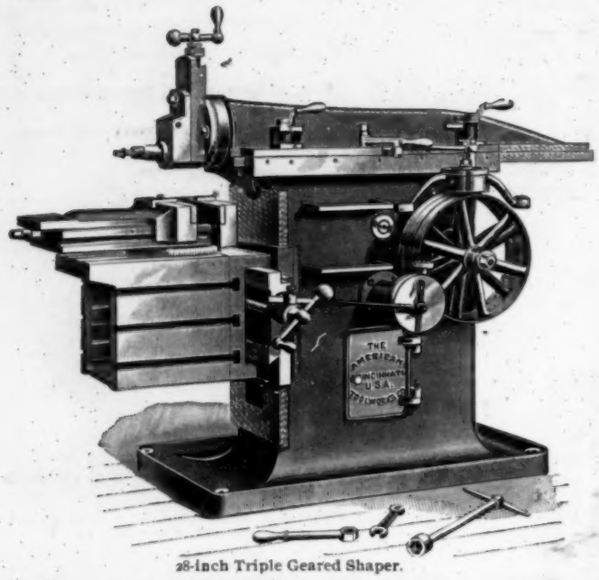

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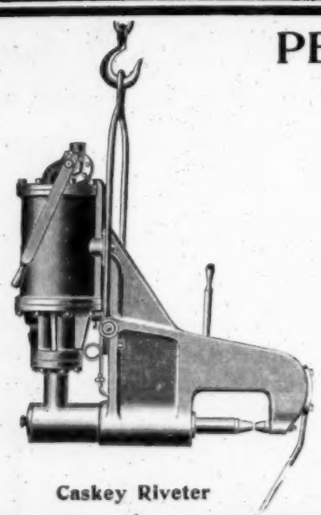

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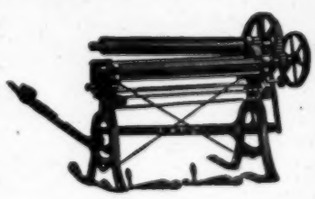

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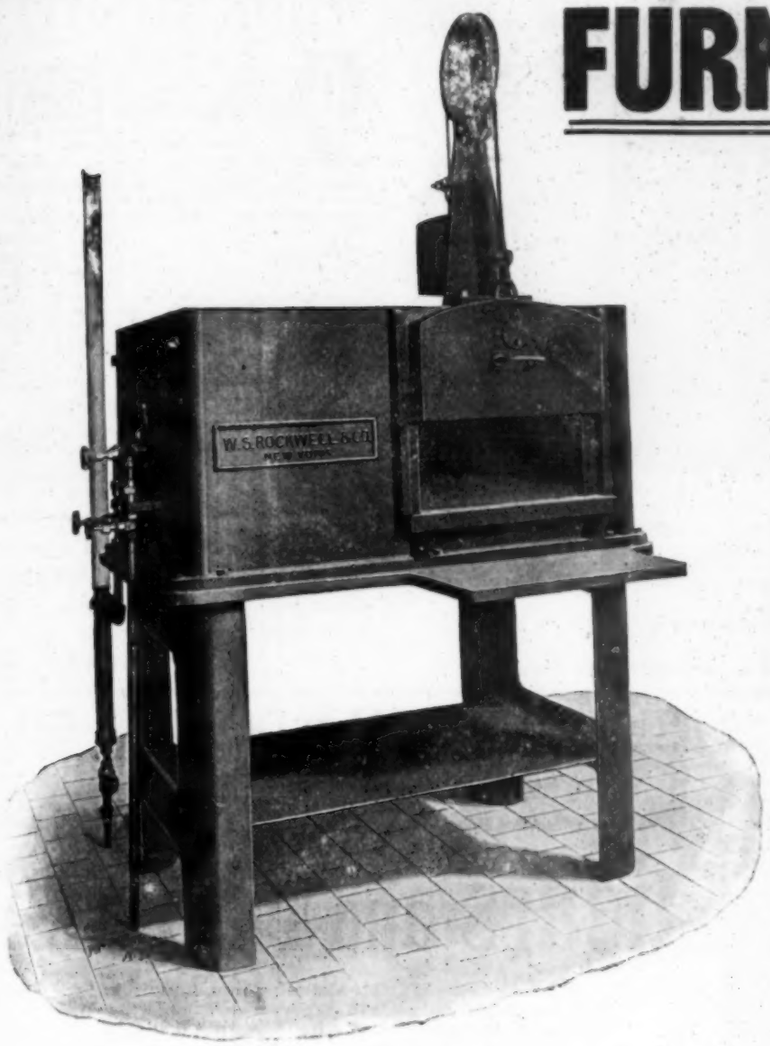

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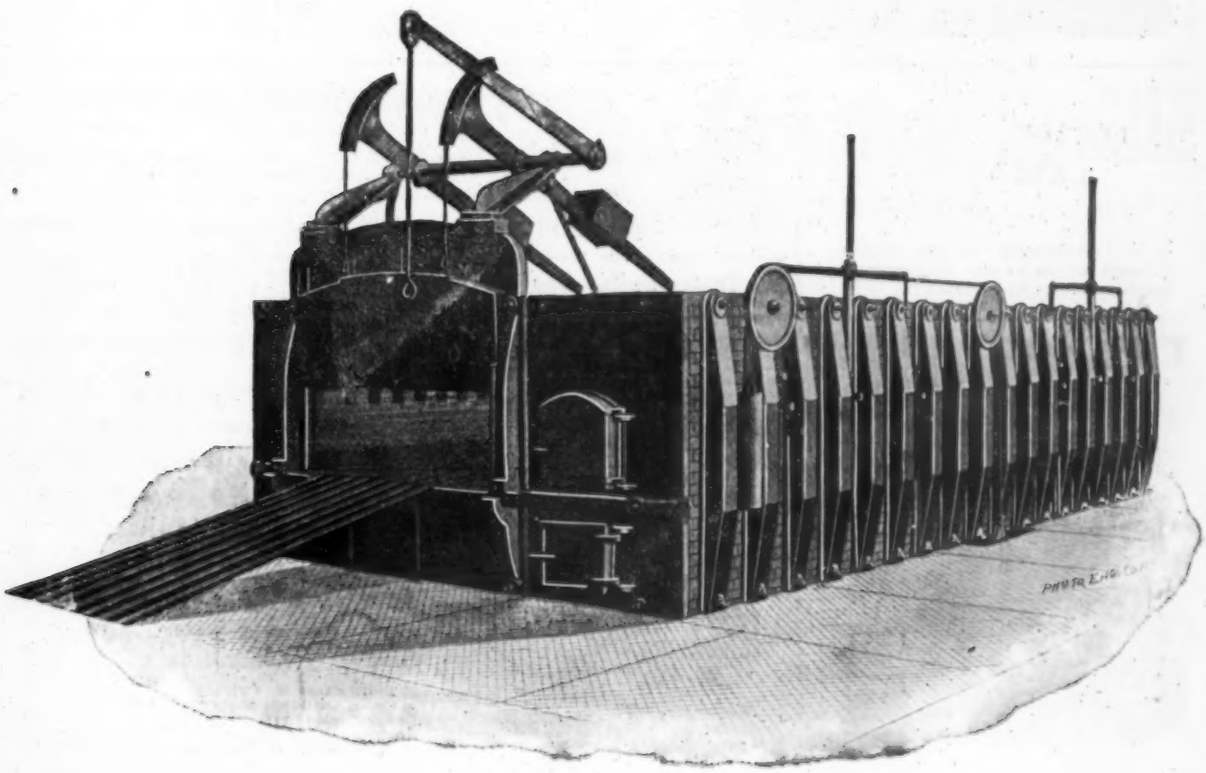

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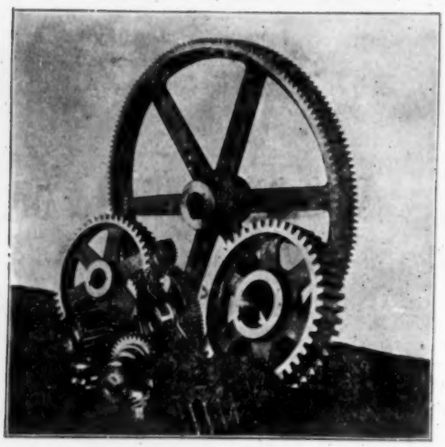

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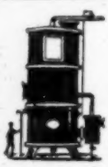

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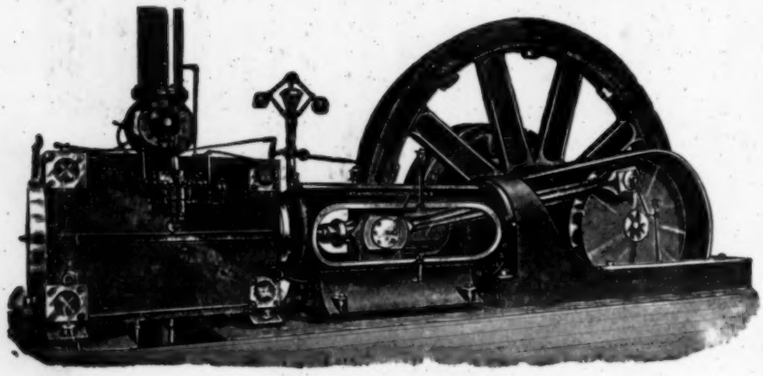

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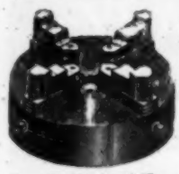

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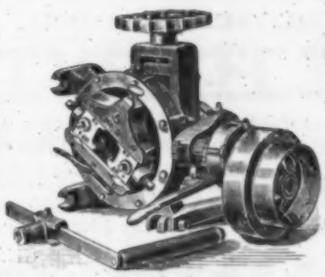

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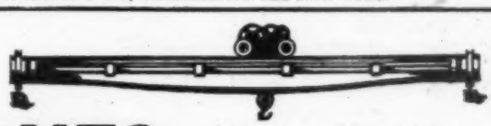

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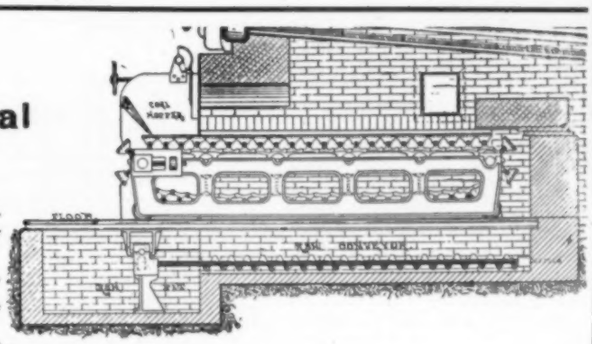

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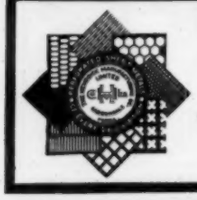

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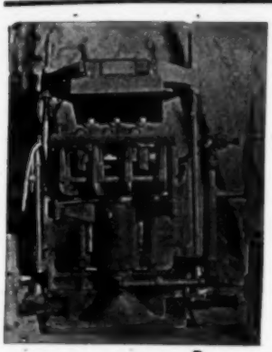

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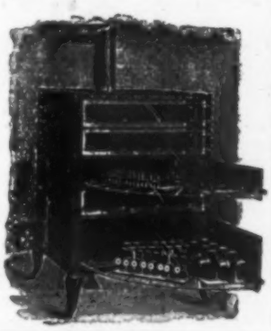

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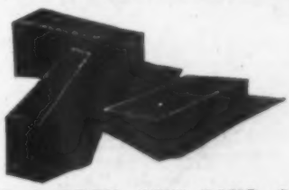

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"Then one-fourth of your life is lost. Do you know rhetoric?"
"Not at all."
"Then half your life is lost. Have you ever studied mathematics?"
"No."
"Then three-fourths of your life is lost."
Just then the boat struck a snag and upset.
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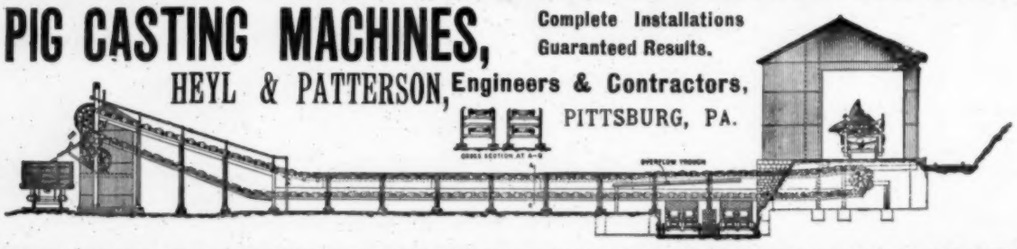

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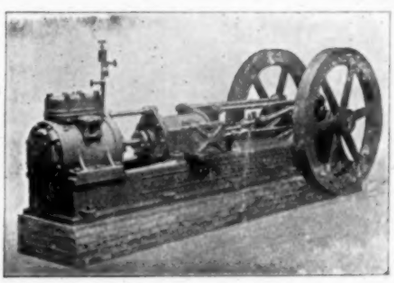

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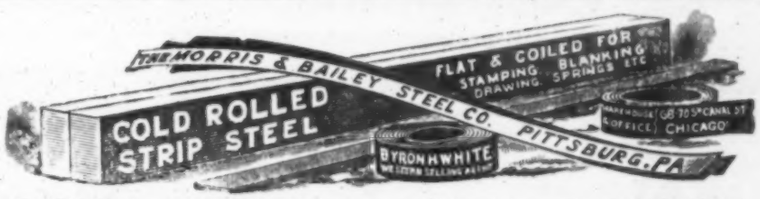
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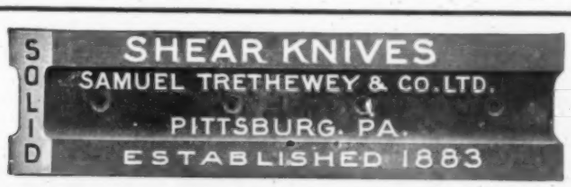

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Thickness ⅛-in. to 1-in.; Widths up to 90-in. Inquiries Solicited. Prompt Shipments.

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We wish to announce to the trade that we are now ready to quote prices for prompt delivery on all kinds of machinery and castings, also wrot iron shell work of any description in connection with blast furnace, steel works and rolling mills, for which our works are especially adapted. Correspondence solicited.

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One second-hand Boring Mill, 84-in. swing, 30-in. under the cross rail, good tool for light work, will be sold cheap. Bement.

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Two 5-ton Steel Gib Cranes, new, double braced, length of gib 28 feet, height under gib 19 feet compound geared, 24 feet under the strut. We can make delivery at once.

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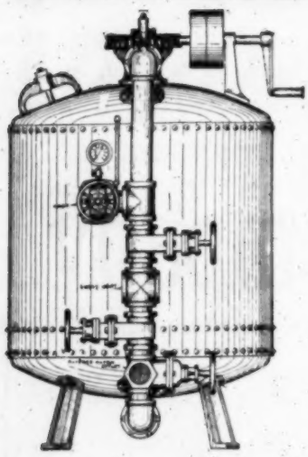

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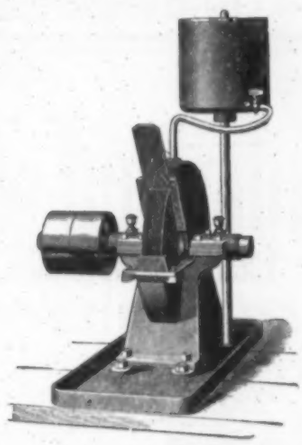

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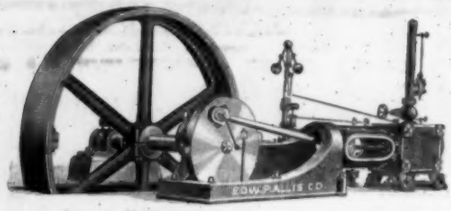

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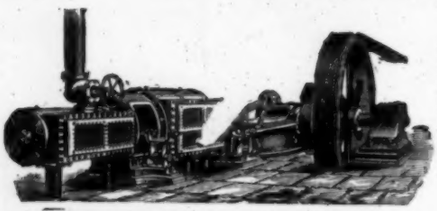

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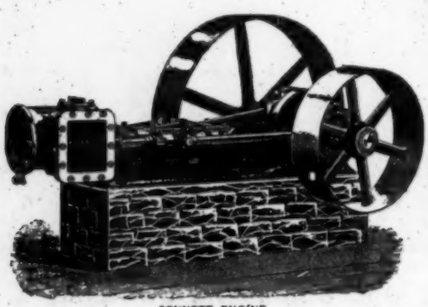

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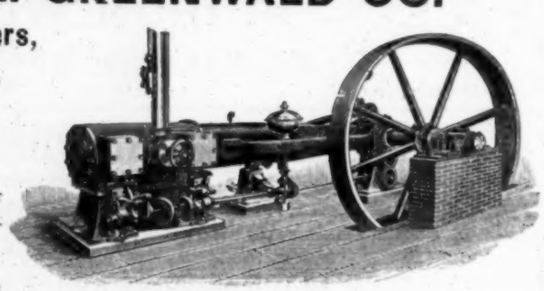

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Jeffrey Mfg. Co., Columbus, O.
Alex Laughlin & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
James Bonar & Co., Pittsburg, Pa.

ENGINE PACKING—
Jenkins Bros., New York City.
C. H. Besly & Co., Chicago, Ill.
James B. Clow & Sons, Chicago, Ill.

ENGINEERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
James B. Clow & Sons, Chicago, Ill.

ENGINE LATHES—
U. Baird Machinery Co., Pittsburg, Pa.
American Tool Works Co., Cincinnati, O.

ENGINES (OIL)—
The Aultman Co., Canton, O.

ENGINES STEAM)—
W. P. Davis Machine Co., Rochester, N. Y
Wm. Tod & Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis
The Hooven, Owens & Rentschler Co., Hamilton, O.
The Anltman Co., Canton, O.
Geo. B.. Sennett Co., Youngstown, Ohio.

ENGRAVERS AND ELECTROTYPERS—
Central Electrotype & Engraving Co., Cleveland.
National Engraving Co., Cleveland, O.,
Samuel R. Mason, Cleveland, O.

FEED WATER HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

FELLOE PLATES—
Avery Stamping Co., Cleveland, O.

FILES, MAKERS OF—
C. H. Besly & Co., Chicago, Ill,

FILTERS—
Wm. B. Scaife & Sons, Pittsburg, Pa.

FIRE BRICK AND CLAY—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Clearfield Fire Brick Co., Clearfield, Pa.
Dover Fire Brick Co., Cleveland, O.
F. B. Stevens, Detroit, Mich.
Chicago Fire Clay Product Co., Chicago, Ill.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Detroit. Mich.
Garden City Sand Co., Chicago, Ill.
A. F. Smith & Co., New Brighton, Pa.
Chas Taylor's Sons Co. Cincinnati, O.

FIRE PROOF COVERING—
C. H. Besly & Co., Chicago, Ill.

FLEXIBLE SHAFTS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FLUE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FOOT AND POWER LATHES—
U. Baird Machinery Co., Pittsburg, Pa.

FORGINGS—
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Steel Co., South Bethlehem, Pa.
Braeburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Samuel Trethewey & Co., Pittsburg, Pa.
Jas. H. Baker Mfg. Co., Pittsburg, Pa.

FOUNDRIES—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Riverside Foundry Co., Cleveland, O.
I. & E. Greenwald Co., Cincinnati, O.
Wheeling Mold & Foundry Co., Wheeling, W.Va.
Excelsior Iron Works Co., Cleveland, O.
Macbeth & Co., Cleveland, O.
Vulcan Foundry & Machine Co., New Castle, Pa.

FOUNDRY EQUIPMENT.
Miller & Hays, Akron, O.
Tabor Mfg. Co., Elizabeth, N. J.
Millett Core Oven Co., Brightwood, Mass.
Brass Founders Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Northern Engineering Works, Detroit, Mich.
Cleveland Crane & Car Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

FOUNDRY FACINGS—
Cleveland Facing Mill Co., Cleveland, O.

FOUNDRY SUPPLIES—
Northern Engineering Works, Detroit, Mich.
Chas. Taylor's Sons Co., Cincinnati, O.
Miller & Hays, Akron, O.
Clearfield Fire Brick Co., Clearfield, Pa.
Cleveland Crane & Car Co , Cleveland, O.
The Ohio Sand Co., Connesut, O
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
A. F. Smith & Co., New Brighton

Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
Millett Core Oven Co., Brightwood, Mass.
Cleveland Facing Mill Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
Chicago Fire Clay Product Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
J. V. Rose, Sharon, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

FRICTION METAL—
James B. Clow & Sons, Chicago, Ill.
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Magnolia Metal Co., New York City.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa.
J. J. Ryan & Co., Chicago. Ill.

FURNACES—
Playford Stoker Co., Cleveland, O.

FURNACE LININGS—
Union Mining Co., Mt. Savage, Md.

FURNACE, MELTING—
Whiting Foundry Equipment Co., Harvey, Ill.

FUEL OIL BURNERS—
W. S. Rockwell & Co., New York City.

GALVANIZED IRON—
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZERS—
Ætna-Standard Iron & Steel Co., Bridgeport, O
Apollo Iron & Steel Co. Pittsburg, Pa.

GALVANIZING POTS—
The Wm. B. Pollock Co., Youngstown, O.

GAS ENGINES—
Northern Engineering Works, Detroit, Mich.

GAUGE COCKS—
James Bonar & Co., Pittsburg, Pa.

GEARING—
I. & E. Greenwald Co., Cincinnati, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.
Fraser & Chalmers, Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

GEAR CUTTING—
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.

GEAR LUBRICANTS—
The Ironsides Company, Columbus, O.

GIRDER WORK—
Wm. B Scaife & Sons, Pittsburg, Pa.

GRINDSTONES—
C. H. Besly & Co., Chicago, Ill.

GRAPHITE PAINT—
Jos Dixon Crucible Co., Jersey City, N. J.

GRATE BARS—
Geo. B Sennett Co., Youngstown, Ohio.

GRAY IRON CASTINGS—
W. A. Jones Foundry Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.

HACK SAWS—
Q & C Co., Chicago, Ill.

HANDLES—
Norwood Bicycle Co., Cincinnati, O.

HANGERS—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

HARNESS SNAPS—
Covert Mfg. Co., West Troy, N. Y.

HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.
The United Boiler Co., Girard, O.

HEAVY HARDWARE—
C. H. Besly & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

HOISTS—
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

HOISTING ENGINES—
The Edward P. Allis Co., Milwaukee, Wis.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron, O.
Excelsior Iron Works Co., Cleveland, O

HOISTING MACHINERY—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
Excelsior Iron Works Co., Cleveland, O.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster, Camp & Lane Machine Co., Akron, O.

HORSE SHOES—
Phoenix Horse Shoe Co., Joliet, Ill.

IMPULSE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

INDUSTRIAL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

INGOT MOLDS—
Lorain Foundry Co., Lorain, O.

INJECTORS—
C. H. Besly & Co., Chicago, Ill.
Manning, Maxwell & Moore, New York City.
James Bonar & Co., Pittsburg, Pa.

INSURANCE COMPANIES—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

IRON BUILDINGS—
Universal Construction Co., Chicago, Ill.
Schiffler Bridge Co., Pittsburg, Pa.
Riter-Conley Co., Pittsburg Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.

IRON, NAILS AND STEEL—
C. H. Besly & Co., Chicago, Ill.
H. H. Stroud & Co. Chicago, Ill
Parkhurst & Wilkinson Co., Chicago, Ill.
L. K. Hirsch, Chicago, Ill.

IRON AND STEEL ROOFING—
Berger Mfg. Co., Canton, O
Ætna-Standard Iron & Steel Co., Bridgeport, O
Cincinnati Corrugating Co., Piqua, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.

IRON ORE—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co. Cleveland, O.
Drake Bartow & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

IRON WORKING TOOLS—
Avery Stamping Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago Ill
U. Baird Machinery Co., Pittsburg, Pa.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Baush & Harris Machine Tool Co., Springfield Mass.
W. P. Davis Machine Co., Rochester, N. Y.
Manning, Maxwell & Moore, New York City.
Bertsch & Co., Cambridge City, Ind.
Skinner Chuck Co., New Britain, Conn.

LADLES—
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
The United Boiler Co., Girard, O.

LATHES—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
American Tool Works Co., Cincinnati, O.

LINK BELTING—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

LOCOMOTIVES—
L. K. Hirsch, Chicago, Ill.
Hyde Bros. & Co., Pittsburg, Pa

MACHINISTS' TOOLS AND SUPPLIES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Baush & Harris Machine Tool Co., Springfield Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

MACHINE SCREWS—
C. H. Besly & Co., Chicago, Ill.

MACHINE SHOPS—
The R. D. Nuttall Co., Allegheny, Pa.
Danielson Machine & Tool Co., Cleveland, O.

MACHINERY AND TOOL STEEL—
C. H. Besley & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.
Monongahela Iron & Steel Co., Pittsburg, Pa.

MAGNESIA COVERING—
C. H. Besly & Co., Chicago, Ill.
James B. Clow & Sons, Chicago, Ill.

MALLEABLE FOUNDRY PLANTS—
Whiting Foundry Equipment Co., Harvey, Ill.

MALLEABLE CASTINGS—
Acme Malleable Iron Works, Buffalo, N. Y.
Buhl Malleable Co., Detroit, Mich.

MANUFACTURING CHEMISTS—
We Fu Go Co., Cincinnati, O.
Grasselli Chemical Co., Cleveland, O.

MANUFACTURED IRON AND STEEL—
Bourne-Fuller & Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.
Republic Iron & Steel Co., Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.

METAL BEARINGS—
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co. Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
Magnolia Metal Co., New York City.
Swarts Metal Refining Co., Chicago, Ills.
F. R. Phillips' Sons Co., Philadelphia, Pa.
J. J. Ryan & Co., Chicago, Ill.

METAL CEILINGS—
Berger Manufacturing Co., Canton, O.

METAL WORK—
Avery Stamping Co., Cleveland, O.

MILL CASTINGS—
Vulcan Foundry & Machine Co., New Castle, Pa.

MILLING MACHINES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

MINING MACHINERY—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis,
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Wm. Cramp & Sons, Philadelphia, Pa
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Excelsior Iron Works Co., Cleveland, O.

MINE PUMPS—
F. M. Prescott Steam Pump Co., Milwaukee, Wis.

MOLDING MACHINES—
Tabor Mfg. Co., Elizabeth, N. J.
Whiting Foundry Equipment Co., Harvey, Ill.

MOLDING SAND—
Ohio Sand Co., Conneaut O.
F. B Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

MULTIPLE DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield, Mass.

NICKEL PLATING OUTFITS—
Northampton Emery Wheel Co., Chicago, Ill

NUTS AND BOLTS—
Upson Nut Co., Cleveland, O.

OILLESS BEARINGS—
C. H. Besly & Co., Chicago, Ill.

OIL BURNERS—
W. S. Rockwell & Co., New York City.

OIL CUPS—
C. H. Besly & Co. Chicago Ill.
James Bonar & Co., Pittsburg, Pa

OIL FILTERS—
James Bonar & Co., Pittsburg, Pa.

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.

OIL SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa
Austin Separator Co., Detroit, Mich.
American Tool Works Co., Cincinnati, O.

ORE CARS—
The Pressed Steel Co. Pittsburg, Pa.

ORE CRUSHERS—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers Chicago, Ill.

ORE SCREENS—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

PACKING—
C. H. Besly & Co., Chicago Ill.
Jenkins Bros., New York City.
James B. Clow & Sons, Chicago, Ill.

PAINT—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.

PATTERN WORKS—
Gobeille Pattern Co., Cleveland, O.
Forsythe Pattern Works, Youngstown, O.

PERFORATED METALS—
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.

PIG IRON—
Rogers, Brown & Co., Cincinnati, O.
Reed F. Blair & Co., Pittsburg, Pa.
Clinton Iron & Steel Co., Pittsburg.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
H. H. Stroud & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Spearman Iron Co., Sharpsville, Pa.
Hickman, Williams & Co., Chicago, Ill,
The Brier Hill Coal & Iron Co., Youngstown, O.
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill,

PIG IRON CASTING APPARATUS—
Heyl & Patterson, Pittsburg, Pa.
G. H. Ginther, Special Agent, Pittsburg, Pa.

PIPE (CAST IRON)—
James B. Clow & Sons, Chicago, Ill.

PIPE (RIVETED STEEL)—
Wm. B. Scaife & Sons, Pittsburg, Pa.

PIPE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

PIPE COVERING—
C. H. Besly & Co., Chicago. Ill.
Jenkins Bros., New York City.

PIPE CUTTING AND THREADING MACHINES—
The Armstrong Mfg. Co., Bridgeport, Conn

PIPE FOUNDRY PLANTS—
Whiting Foundry Equipment Co., Harvey, Ill.

PISTON RODS—
Bethlehem Steel Co., So. Bethlehem, Pa.

PLANERS—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O
Manning, Maxwell & Moore, New York City.
American Tool Works Co., Cincinnati, O

PLATES—
Enterprise Boiler Co Youngstown O.
Republic Iron & Steel Co., Chicago, Ill.
Universal Construction Co., Chicago, Ill.

PLUMBERS' AND GAS FITTERS' SUPPLIES—
C. H Besly & Co., Chicago. Ill
James B. Clow & Sons, Chicago, Ill.

PNEUMATIC APPLIANCES—
Clayton Air Compressor Works, New York.

PNEUMATIC TOOLS—
American Pneumatic Tool Co., New York City
Q & C Co., Chicago. Ill.
W. J. Schaefer & Co., New York City.

PORTABLE FORGE—
C. H. Besly & Co., Chicago, Ill.
Vulcan Mfg. Co., Pittsburg, Pa.

POWER DROP HAMMERS—
Baush & Harris Machine Tool Co., Springfield Mass.

POWER PRESSES—
Avery Stamping Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

POWER TRANSMISSON MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
E. A. Delano, Chicago. Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

PRESSES—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co Chicago Ill.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.
Avery Stamping Co., Cleveland, O.

PRESSURE GAUGES—
The Bristol Co., Waterbury, Conn.
James Bonar & Co., Pittsburg, Pa.

PULLEYS—
W. A. Jones Foundry Co., Chicago, Ill
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.

PUMPS (STEAM)—
The Edward P. Allis Co Milwaukee, Wis
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred M. Prescott Steam Pump Co., Milwaukee Wis.
Hall Steam Pump Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.

PUNCHES—
E. Konigslow & Bro. Cleveland, O.

PYROMETERS—
Edward Brown, Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.

RADIAL DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield, Mass
American Tool Works Co., Cincinnati, O.

RAILS—
L. K. Hirsch, Chicago, Ill.
Hyde Bros. & Co., Pittsburg, Pa.

RAILWAY SUPPLIES—
Cleveland City Forge & Iron Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
L. K. Hirsch, Chicago, Ill.

RELAYING RAILS—
L. K. Hirsch, Chicago, Ill.
Hyde Bros & Co., Pittsburg, Pa.

RIVETS—
Champion Rivet Co. Cleveland, O.
Jouse & Laughlins, Ltd., Pittsburg, Pa.

RIVETED STEEL PIPE—
The Wm. B. Pollock Co. Youngstown, O.

ROCK DRILLS—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

ROLL FORGINGS—
Samuel Trethewey & Co., Pittsburg, Pa.

ROLLING MILL MACHINERY—
The United Boiler Co., Girard, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa
Whiting Foundry Equipment Co., Harvey, Ill.
The Lloyd Booth Co., Youngstown, O.
Vulcan Foundry & Machine Co., New Castle, Pa.

ROOFS—
Shiffler Bridge Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.

SAWS—
Peter Gerlach & Co., Cleveland, O.

SCRAP IRON—
L. K. Hirsch, Chicago, Ill.
Hyde Bros & Co., Pittsburg, Pa.
Universal Construction Co., Chicago, Ill.

SCREENS FOR COAL, ORE, ETC.—
Robt. Aitchison Perforated Metal Co., Chicago.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

SCREWS—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill

SCREW MACHINES—
Cleveland Ball & Screw Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.

SECOND HAND MACHINERY—
L. K. Hirsch Chicago, Ill.
Hyde Bros & Co., Pittsburg, Pa.
Geo. D. Moffat & Co, Chicago, Ill.

SENSITIVE DRILLS—
American Tool Works Co, Cincinnati, O.

SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.

SHAFTING—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland, O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.
Bethlehem Steel Co., South Bethlehem, Pa.
American Steel & Wire Co., Chicago, Ill.

SHAPERS—
W. P. Davis Machine Co., Rochester, N. Y.
Baush & Harris Machine Tool Co., Springfield, Mass.
American Tool Works Co., Cincinnati, O.

SHEARING AND PUNCHING MACHINERY—
Bertsch & Co., Cambridge City, Ind.
Danielson Machine & Tool Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.

SHEAR KNIVES—
Samuel Trethewey & Co., Pittsburg, Pa.

SHEET IRON—
Ætna-Standard Iron & Steel Co., Bridgeport, O.
E. H. Stroud & Co., Chicago. Ill.
Republic Iron & Steel Co., Chicago, Ill.
Struthers Iron & Steel Co., Struthers, O.

SHIP YARDS—
Wm. Cramp & Sons, Philadelphia, Pa.

SOLID STEEL SHEAR KNIVES—
Samuel Trethewey & Co., Pittsburg, Pa.

SPIKES—
L. K. Hirsch, Chicago, Ill.

SPECIAL MACHINERY—
American Tool Works Co, Cincinnati, O.
James Bonar & Co., Pittsburg, Pa.
Avery Stamping Co., Cleveland, O.
Q & C Co., Chicago, Ill.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
E. Konigslow & Bro. Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Danielson Machine & Tool Co., Cleveland, O.

STACKS—
Wm. B. Scaife & Sons, Pittsburg, Pa.

STAND PIPES—
The Wm. B. Pollock Co. Youngstown, O.
The United Boiler Co., Girard, O.

STEAM BOILER INSPECTORS—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

STEAM PIPE AND BOILER COVERING—
C. H. Besly & Co., Chicago Ill.

STEAM PACKING—
James B. Clow & Sons, Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.

STEAM PUMPS—
Hall Steam Pump Co., Pittsburg, Pa.
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred. M. Prescott Steam Pump Co., Milwaukee, Wis.
Edw. P. Allis Co., Milwaukee, Wis.
Southwark Foundry and Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

STEAM SEPARATORS—
James Bonar & Co., Pittsburg, Pa.
Austin Separator Co., Detroit, Mich.
Harrison Safety Boiler Works, Philadelphia, Pa.

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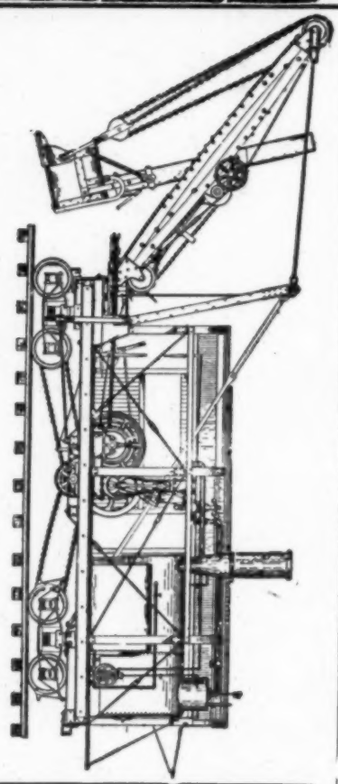

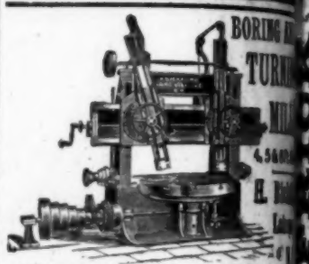

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